Page 1-2

1453

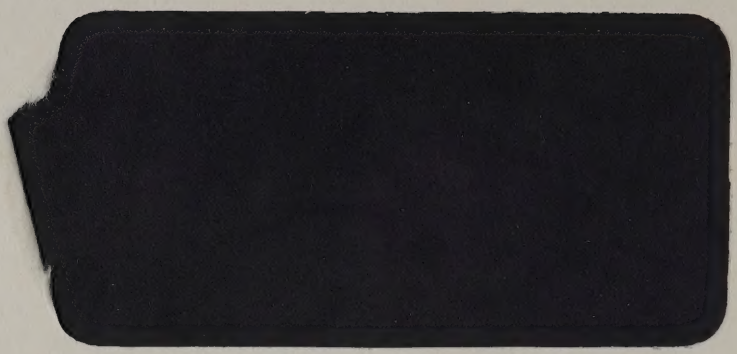
instruction manual

CALIBRATION LAB.

MODEL 1453

PRINTER

Beckman® / *Berkeley Division*



INTERIM

INSTRUCTION MANUAL

CALIBRATION LAB.

MODEL 1453

PRINTER

Serial_____

Represented by
RIDGWAY ASSOCIATES
3384 W. TWELVE MILE
Berkley, Michigan Lincoln 6-3312

Beckman/Berkeley Division
Richmond 3, California

March 1962

WARRANTY

Instruments sold by Berkeley Division, Beckman Instruments, Inc., (hereafter called "the Company") are warranted only as stated below.

Subject to the exceptions and upon the conditions specified below, the Company agrees to correct, either by repair, or, at its election, by replacement, any defect of material or workmanship which develops within one year after delivery of the instrument to the original purchaser by the Company or by an authorized representative, provided that investigation and factory inspection by the Company discloses that such defect developed under normal and proper use.

The exceptions and conditions mentioned above are the following:

(a) Some components and accessories by their nature are not intended to, and will not, function one year. If any such component or accessory manufactured by the Company and part of the item sold fails to give reasonable service for a reasonable period of time, the Company will, at its election, replace or repair such component or accessory. What constitutes reasonable service and what constitutes a reasonable period of time shall be determined solely by the Company after the Company is in posession of all the facts concerning operating conditions and other pertinent factors and after such component or accessory has been returned to the Company, transportation prepaid.

(b) All instruments claimed defective must be returned to the Company, transportation charges prepaid, and will be returned to the customer with the transportation charges collect, unless the item is found to be defective in which case the Company will pay all transportation charges.

(c) The Company makes no warranty concerning components or accessories not manufactured by it, such as tubes, fuses, batteries, etc. However, in the event of the failure of any component or accessory not manufactured by the Company, the Company will give reasonable assistance to the purchaser in obtaining from the respective manufacturer whatever adjustment is reasonable in the light of the manufacturer's own warranty.

(d) Except as stated above, the Company makes no warranty, express or implied (either in fact or by operation of law), statutory or otherwise; and, except to the extent stated above, the Company shall have no liability under any warranty, express or implied (either in fact or by operation of law), statutory or otherwise.

(e) The Company expressly disclaims any liability to its customers, dealers, and to users of its products, and to any other person or persons for consequential damages of any kind and from any cause whatsoever arising out of or in any way connected with the manufacture, sale, repair, replacement of, or arising out of or in any way connected with the use of any of its products.

(f) Representations and warranties made by any person, including representatives of the Company, which are inconsistent or in conflict with the terms of this warranty (including but not limited to the limitation of the liability of the Company as set forth above) shall not be binding upon the Company unless reduced to writing and approved by an officer of the Company.

(g) This warranty shall be governed by the laws of the State of California.

Claims for damage in shipment should be filed promptly with the transportation company.

All correspondence concerning the instrument should specify the model and serial number. This information appears on the company name plate. Any inquiry concerning details of operation, possible modifications, etc., should be addressed to the Sales Department, Berkeley division of Beckman Instruments, Inc., Richmond 4, California.

REPAIR SERVICE

Experienced service personnel and special test equipment are available at the factory to perform any necessary repairs. Every effort will be made to expedite the repair of instruments returned for servicing. Repair work will be performed only upon receipt of a written purchase order or authorization. Instruments to be repaired should be addressed to SERVICE AND REPAIR DEPARTMENT with transportation charges prepaid. Repaired instruments will be returned to the purchaser with transportation charges collect.

Berkeley reserves the right to make changes in design at any time without incurring any obligation to modify equipment previously purchased to conform to subsequent design changes.

BERKELEY DIVISION
BECKMAN INSTRUMENTS, INC.

INSTRUCTION MANUAL REVISION

Model 1453 Printer

Correction: Page 1-2, " Color Control, Manual" should read: "Two position lever selects red or black print-out".

Page 4-0, figure 4-1. Step 3 should read, "Loosen screw at each side".

Page 4-7, figure 4-4. Clearance between cam and follower leaf should read, ".010 to .020 in."

CONTENTS

		Page
SEC. 1	INTRODUCTION	
1.1	General Description	1-1
1.2	Specifications	1-1
SEC. 2	OPERATION	
2.1	Preparing for Operation	2-1
2.2	Controls	2-8
2.3	Operating the Printer	2-8
SEC. 3	THEORY OF OPERATION	
3.1	Basic Design	3-1
3.2	Circuit Logic	3-1
3.3	Control Circuit	3-2
3.4	Position Transducer	3-6
3.5	Input Code Modules	3-9
3.6	Pawl Magnets and Stop Pawls	3-11
3.7	Resetting and Restoring	3-13
3.8	Code Generator	3-13
SEC. 4	SERVICING	
4.1	Preparing the Printer for Servicing	4-1
4.2	Troubleshooting	4-1
4.3	Possible Faults in Operation	4-3
4.4	Mechanical Adjustments	4-5
4.5	Lubrication Procedure	4-8

SCHEMATIC DIAGRAMS

Timing Diagram (62-D-55)

Model 1453 Master Schematic Diagram (D-408311-Rev. B)

4-Line Input Module Schematic Diagram (B-404461-Rev. B)

CONTENTS (Continued)

4-Line Input Cable Schematic Diagram (62-D-56)
10-Line Input Code Module Schematic Diagram (C-404454-Rev. A)
10-Line Input Cable Schematic Diagram (62-C114)

SECTION 1

INTRODUCTION

1.1 GENERAL DESCRIPTION

The Model 1453 Printer converts electrical data into printed characters on a paper tape, printing up to 12 digits in black or red at a maximum rate of 3 lines a second. As normally supplied, the printer has a capacity of 7 digits and will accept binary-coded decimal data of 1-2-2-4, 1-2-4-2, and 1-2-4-8 weighting.

Since each column is controlled by a separate plug-in module, coupled to the main input cable by a separate connector, the user can arrange the digits in any order.

In addition to the standard four-line BCD modules, ten-line modules are available that will accept both decimal and BCD data. With these modules, both types of data can be entered on the same line.

1.2 SPECIFICATIONS

Column Capacity	7 to 12 digit-columns.
Digit Printout	0 through 9, plus column suppression (blank).
Printing Rate	3 lines per second maximum.
Accuracy	Identical to data input sources.
Control Voltages	Binary "0", -12 to -50 volts (maximum). Binary "1", 0 to +50 volts (maximum).
Input Code	FOUR-LINE BCD: 1-2-2-4, 1-2-4-2, or 1-2-4-8. With approximately 2 megohms source resistance per line, binary "0" and binary "1" are as shown under "Control Voltages". With approximately 100K ohms source resistance per line, binary "0" is -8 to -50 volts (maximum), binary "1" is 0 to +50 volts (maximum). TEN-LINE DECIMAL: One wire binary "1", eight wires binary "0". Binary "0" on nine wires represents digit "0".

Input Resistance	FOUR-LINE and TEN-LINE Code Modules: Approximately 10 megohms for negative inputs, 200K ohms for positive inputs.
Code Control	Normally 1-2-2-4 BCD; single line grounded for 1-2-4-8 (1-2-4-2) BCD (1 ma maximum, +10 volts open circuit).
Color Control	Manual: Two-position level selects red or black print-out. Electrical: Red, binary "1" or open circuit; black, binary "0". Approximately 2 megohms input resistance.
Column Suppression	Single line grounded for each column suppressed. (3 ma maximum, +10 volts open circuit). Removal of input code module also suppresses column.
Print Command	Change from binary "1" to binary "0". Binary "0", 100 ms minimum after print command; binary "1", 15 ms minimum before next print command. Source resistance 1 megohm maximum.
Inhibit Reset Command	Occurs no more than 50 ms after print command; 200 ms maximum duration.
Internal Ground	Internal ground is isolated from chassis ground, and can be biased to ±100 v.
Printing Ribbon	Burroughs adding machine ribbon, 10 key, black and red, medium 7/16" (Beckman stock # 812854)
Paper	Standard 2-1/4" roll tape or fan-folded tape.
Power Requirements	117 v rms ±10%, 60 cps. Approximately 0.7 amps, 45 watts.
Dimensions	Printer: 8" H x 8" W x 16" D. M-type Portable Case: 10" H x 9" W x 13" D. * K-type Rack Adapter: 8-3/4" H x 19" W x 15-1/4" D* L-type Bench Cabinet: 10-5/8" H x 20" W x 15-7/8" D* *(Add 3-1/2" D to include extended front of printer.)

Net Weights	Printer:	30 lb.
	M-type Portable Case:	5 lb.
	K-type Rack Adapter:	15 lb.
	L-type Bench Cabinet:	30 lb.

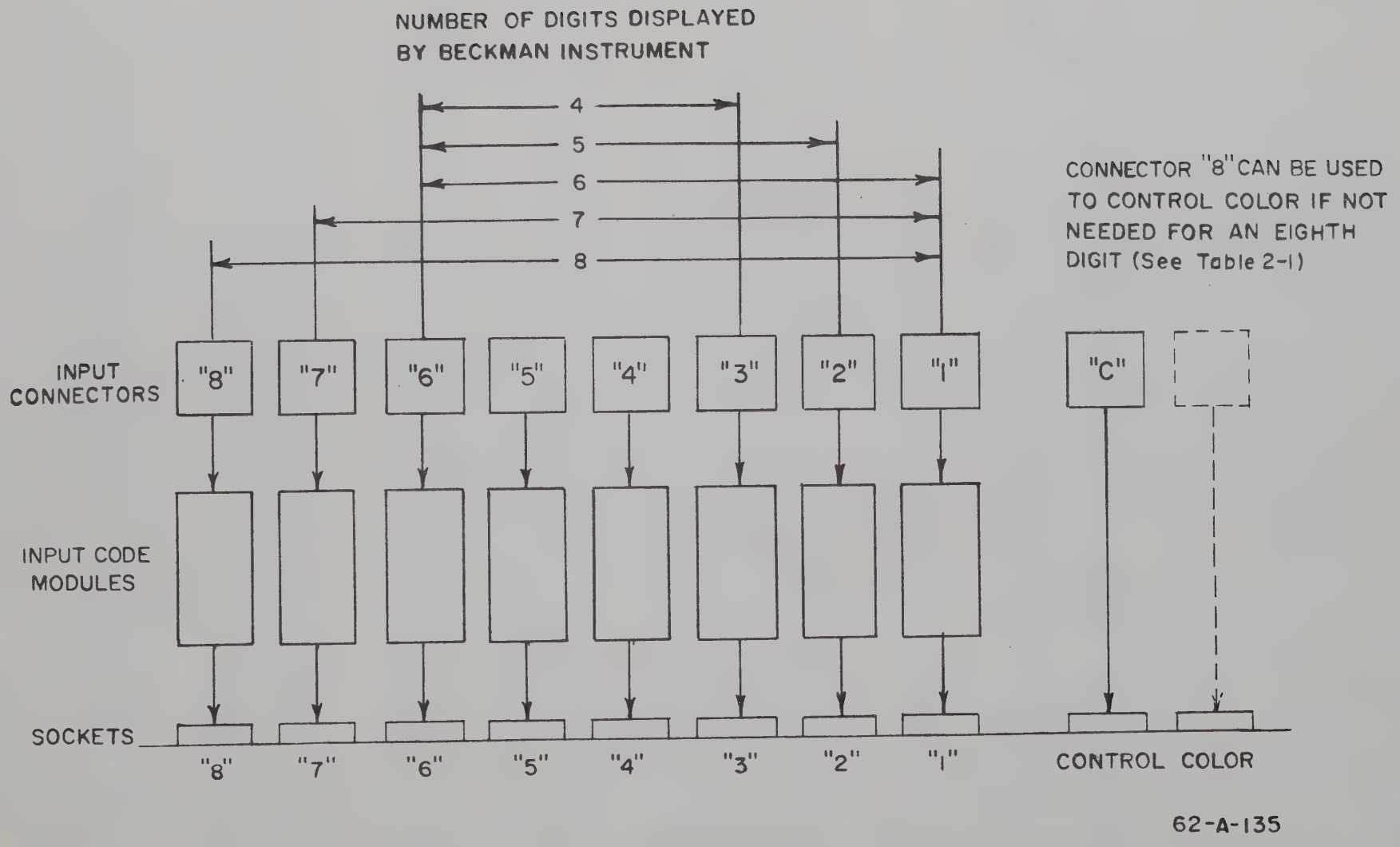


FIG. 2-2 Arrangement of input code modules and connectors when the Model 1453 is used with a Beckman instrument. Numbers "1" through "8" correspond to the digit columns, reading from right to left across the paper tape.

column suppression, as described in Table 2-1. A voltage of binary "1" on any one line represents the digit corresponding to the pin number. Binary "0" on all lines represents the digit "0".

To operate the printer when all modules are ten line:

1) Program the printer for 1-2-2-4 code as explained in Table 2-1.

2) Move the switch on each module to the position marked "1-2-2-4".

2.1.5 Using Mixed Decimal and BCD Data with Ten-Line Input Code Modules

If the data are partially decimal and partly BCD:

1) Program the printer to suit the BCD code you are using, as described in Table 2-1.

2) Move the switch on each module to "1-2-2-4" or "1-2-4-8", according to the BCD code in use.

2.1.6 Using BCD Data with Ten-Line Input Code Modules. BCD input to each ten-line module is on four lines, wired to pins 1, 2, 4, and 6 (corresponding to weights 1, 2, 2, and 4, or 1, 2, 4, and 8, in that order) of the module connector (P201).

To operate the printer with BCD data:

1) Apply the data to pins 1, 2, 4, and 6 of P201.

2) Connect pin 11 (a source of binary "0" bias) to pins 3, 5, 7, 8, and 9.

3) Move the switch on each module to "1-2-2-4".

4) Program the printer for 1-2-2-4 or 1-2-4-8, as described under "Code Control" in Table 2-1.

2.1.7 Identifying Connections to the Input Cables. Wiring diagrams for the four-line and the ten-line input cables are given in the schematic section of the manual.

2.1.8 Connecting a Data Source. To use the printer with a Beckman instrument, simply plug the input cable into the DIGITAL RECORDER socket on the instrument. This socket carries all the data and control signals needed for automatic operation of the printer.

With data sources other than Beckman instruments, you will need to make appropriate connections to the cable, using the input cable schematic diagrams as a guide.

Table 2-1. Electrical Control Functions

Control Signal	Function
Print Command	With the print switch at PRINT, a change from binary "1" to binary "0" at pin 5 of J409 starts a printing cycle. Binary "0" must be maintained for 100 milliseconds minimum to start the cycle. The print command line must return to binary "1" for at least 15 milliseconds before the next cycle can be started.
Code Control	Programs the printer for input data of 1-2-2-4, 1-2-4-2, or 1-2-4-8 weighting (1-2-4-2 and 1-2-4-8 are the same to the Model 1453). A contact closure from pin 7 of J409 to power ground allows 1-2-4-2 or 1-2-4-8 data to be used. With pin 7 ungrounded, the printer is set to respond to 1-2-2-4 code.
Inhibit Reset Command	This command is generated by the printer to stop the data source from resetting before the data have been printed. Available at pin 1 of J409, the command is a contact closure through a 220Ω resistor to power ground occurring no more than 50 milliseconds after print command and lasting no longer than 200 milliseconds after print command.
Color Control	Permits electrical control of the printing color. The red/black lever must be at red for electrical control of color. Binary "1" or open circuit at pin 6 of J408 produces a red impression; binary "0", a black impression.
Column Suppression	Produces a blank impression in the column controlled. A contact closure to power ground from pin 10 of the top connector (P201) of any module will suppress the column. Note that pin 10 of connectors "1", "2", "7", and "8" is wired to the main connector. Removing a module will also suppress the corresponding column.

Table 2-2. Modifications to DIGITAL RECORDER Connector of Beckman Instruments to ensure compatibility with the Model 1453.

Model	Highest Serial No. *	Pins to be grounded	Model	Highest Serial No. *	Pins to be grounded
5210	299	29, 30, 31, 32	7270	200	32
5220	183	29, 30, 31, 32	7350	1430	30, 31, 32
5230	601	29, 30, 31, 32	7351	262	30, 31, 32
5310	140	30, 31, 32	7360	4224	31, 32
5311	120	30, 31, 32	7361	405	31, 32
5571	1314	31, 32	7370	2374	32
7050	462	30, 31, 32	7700	170	31, 32
7060	552	31, 32	8070	104	32
7070	125	32	8150	102	30, 31, 32
7150	1627	30, 31, 32	8151	111	30, 31, 32
7151	437	30, 31, 32	8160	104	31, 32
7152	105	30, 31, 32	8175	111	32
7160	1098	31, 32	8260	101	31, 32
7161	170	31, 32	8350	103	30, 31, 32
7170	435	32	8351	102	30, 31, 32
7175	200	32	8360	102	31, 32
7250	521	30, 31, 32	8370	123	32
7260	396	31, 32			

*Instruments with this serial number and below will probably need modification. See Section 2. 1. 9 for instructions.

2. 1. 9 Modifying Older Beckman Instruments. Although Beckman instruments in current production have readout connections that are correct for the Model 1453, earlier instruments will need slight modification to suit the 1453. The modification will automatically suppress any digit columns not being used.

To see whether a modification is needed, refer to Table 2-2. If the serial number of the instrument you are using is higher than that shown in the table, take no action. If, however, it is the same as that shown in the table, or if it is lower, add the necessary jumper wires to the DIGITAL RECORDER connector on the instrument.

2.1.10 Inserting the Paper Tape. To put a roll of paper into the printer, follow these steps:

1) press the paper access button. Figure 2-2 shows where it is.

2) Let the paper compartment drop forward.

3) Place a roll of paper in the spring-loaded holder so that the paper feeds from the bottom toward the mechanism.

4) Bend the end of the paper up toward you, then fold it sharply across to make a straight leading edge.

5) Feed the end into the paper guide below the platen (the rubber roller).

6) Move the paper advance lever toward you several times until the paper appears in the outlet, making sure that the paper is between the inked ribbon and the platen.

7) Close the compartment.

8) Pressing the paper release button, pull the paper out until it is straight.

2.1.11 Replacing the Ribbon. To replace the inked ribbon, follow these steps while referring to Figure 2-3:

1) Remove the panel retaining screw (upper) from each side of the printer.

2) Tip the front panel forward.

3) On each spool, swing the ribbon spool retainer away from the ribbon spool post; then slide off the spool.

4) Remove the ribbon from one spool and discard the old ribbon and the other spool.

5) Attach the free end of the new ribbon to the spool you have kept, making sure that the black edge is against the outer flange of the spool.

6) Place the spools on the spool posts so that the ribbon feeds toward the bottom of the spool.

7) Check that the driving stud in each ratchet wheel is engaged in one of the holes in the spool; then lock the spool with the retainer.

8) Thread the ribbon over the guide stud and through the ribbon guides as shown.

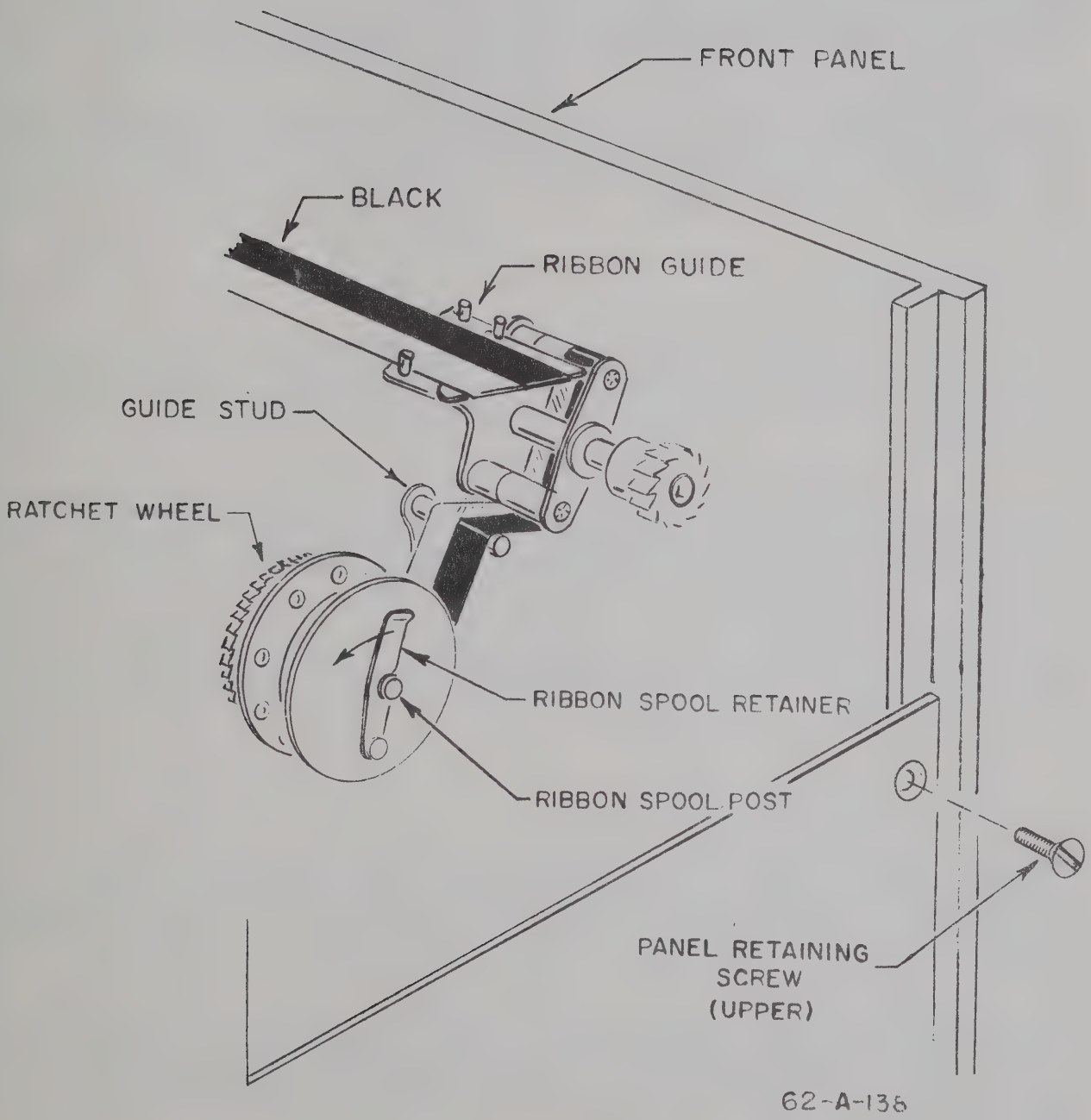


FIG. 2-3 Follow the steps in Section 2. 1. 11 to replace the inked ribbon.

9) Take up any slack in the ribbon by turning the spool that is free. Do not use force.

10) Swing the front panel back into place and replace the two retaining screws.

2.1.12 Applying power. Before connecting the printer to the power line, place the POWER switch at the "off" position and the print switch at "standby" by pressing the lower half of each. Then plug the power cord into a 117 volt ac outlet (or a 220 volt outlet if the printer has Modification H).

Place the POWER switch at the "on" position by pressing its upper half. You will hear a subdued noise from the motor, which will now be running with the clutch disengaged. Also, you will see light in the paper outlet, showing the printer is ready for use.

2.2 CONTROLS

2.2.1 Manual Controls. With the exception of the code weighting switch on the ten-line input code module described in Section 3.5.3, the operating controls are on the front panel. Their positions and functions are shown on Figure 2-1.

2.2.2 Electrical Control. Table 2-1 summarizes the electrical controls. In this table, binary "0" means -12 to -50 volts (maximum); binary "1" means 0 to +50 volts (maximum). Note that power ground is not the same as signal ground (see Master Schematic Diagram).

Pin numbers in the table refer to the individual connectors on the printer. To find the corresponding pins on the main connector, see the Four Line Input Cable Schematic Diagram.

2.3 OPERATING THE PRINTER

2.3.1 Recording Data. Once you have made the preparations described in Section 2.1, you need only move the print switch to the PRINT position to record data. With the switch in this position, the printing cycle described in Section 3 will take place upon receipt of an external print command.

2.3.2 Turning Off the Printer. When you have finished with the printer, switch to standby before turning off the power. This precaution will ensure that the pawl magnet assembly is mechanically locked in the energized position to prevent the accumulation of dust and lint between the armatures and the magnets.

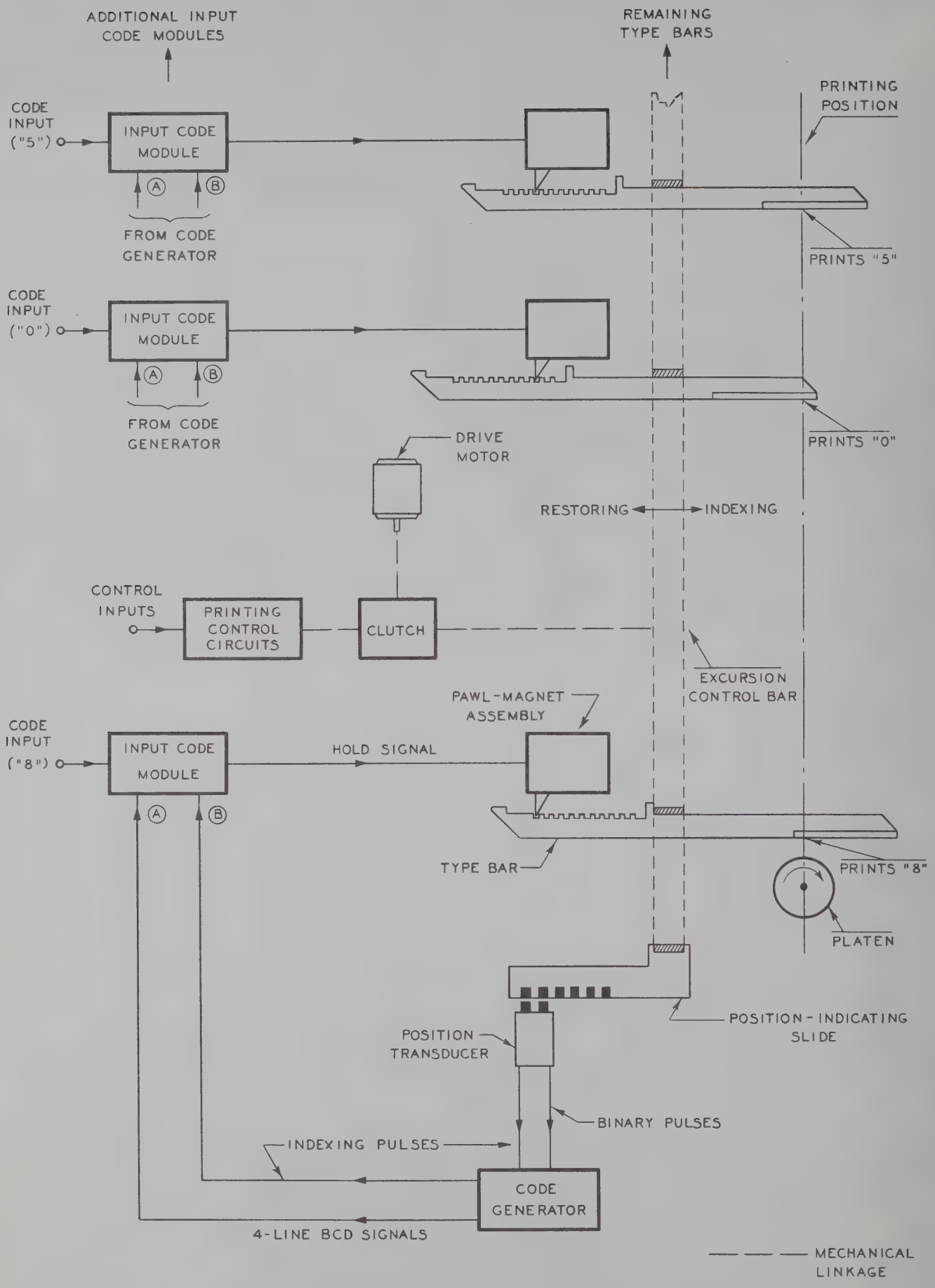


FIG. 3-1 Functional block diagram of the Model 1453.

61-C-52

SECTION 3

THEORY OF OPERATION

3.1 BASIC DESIGN

Designed to record up to 12 digits of data in two colors at rates up to 3 lines a second, the Model 1453 is a motor-driven printing machine controlled by electronic circuits.

Basically, the mechanism is a Burroughs Series J ten key adding machine from which the manually-operated listing keys, functional keys, and intermediate keyboard have been removed. Input code modules, pawl magnets, and stop pawls – one set for each column of digits – replace the listing keys and the intermediate keyboard; printing control circuits take the place of the functional keys.

Since the Model 1453 enters data during machine operation instead of before ("parallel entry" in contrast to "serial entry"), the part of the printing cycle needed for data entry is reduced to less than 200 milliseconds. During this period, the 1453 generates an "inhibit reset" signal that can be used to stop the input data from changing.

3.2 CIRCUIT LOGIC

Figure 3-1 shows the circuit logic in simplified form.

In its standby condition, the printer is energized, with the clutch disengaged and the drive motor running freely. A mechanical lock keeps the stop pawls in the "holding" position, clear of the type bars.

When the standby/print switch on the front panel is moved to the PRINT position, the 1453 is made ready to respond to a print command. As soon as the command arrives, the clutch control circuit engages the clutch, which then couples power from the motor through a camshaft to the printing mechanism.

The excursion control bar starts its "indexing" movement toward the printing position, followed by the type bars, which are held against it by springs. At the same time, the lock on the stop pawls is released, leaving them held clear of the type bars by a holding current flowing in the pawl magnet coils.

Driven by the position indicating slide, which is attached to the excursion control bar, the position transducer generates indexing pulses and binary pulses representing the decimal position of the type bar assembly. In

response to the binary pulses, the code generator produces four-line BCD signals – of 1-2-2-4 or 1-2-4-8 weighting, according to the state of the code control line – which each input code module compares with the four-line BCD data at its input. When the two data sources agree, the type bar is thus in the decimal position corresponding to the input digit. At this moment, the module allows an indexing pulse to cut off the holding current in the pawl magnet. The stop pawl then drops into a notch on the type bar, stopping the bar in the required position.

If there is no input code module plugged in for a particular column of digits, or if a column suppression signal is applied, the module has no source of holding current. As a result, the pawl automatically drops into the "no print" notch at the start of the printing cycle, stopping the type bar in a blank position.

By the time the excursion control bar has completed its indexing travel, all typebars have been correctly latched. The platen then rises, pressing the type faces and inked ribbon against a roll of paper to print one line of data. By using a color lever on the front panel or applying a suitable voltage to the color control line, the operator can make this impression red or black.

After the printing operation, the paper advances one line and the excursion control bar begins its restoring travel, returning the type bars to the starting position and mechanically resetting the pawls. At the same time, the position transducer and code generator are reset. Finally, the clutch is mechanically disengaged, the motor then running freely until the next print command starts a new printing cycle.

3.3 CONTROL CIRCUIT

3.3.1 Design of the Control Circuit. In response to external signals – print command and color control command – the control circuit starts a printing cycle and selects the color of the impression. Both commands are applied to a control trigger circuit (V101 and Q107) which drives a clutch actuating circuit (Q103 and K103) and a color selector (K102). Interference between clutch control and color control is avoided by the timing sequence of the two functions, as described in Section 3.3.3.

3.3.2 Control Trigger Circuit. Consisting of a cathode follower (V101A) and a trigger stage (V101B and Q107), the control trigger circuit, described in Figures 3-2 and 3-3, serves two main purposes. First, it presents a high input impedance to the external control signals - print command and color control command - and a low output impedance to the solid-state circuitry of the printer. Second, it responds only when the voltage on the print command line drops below a predetermined triggering level of about -8 volts for a period long enough to operate the clutch actuator. As a result, the circuit is not affected by noise transients.

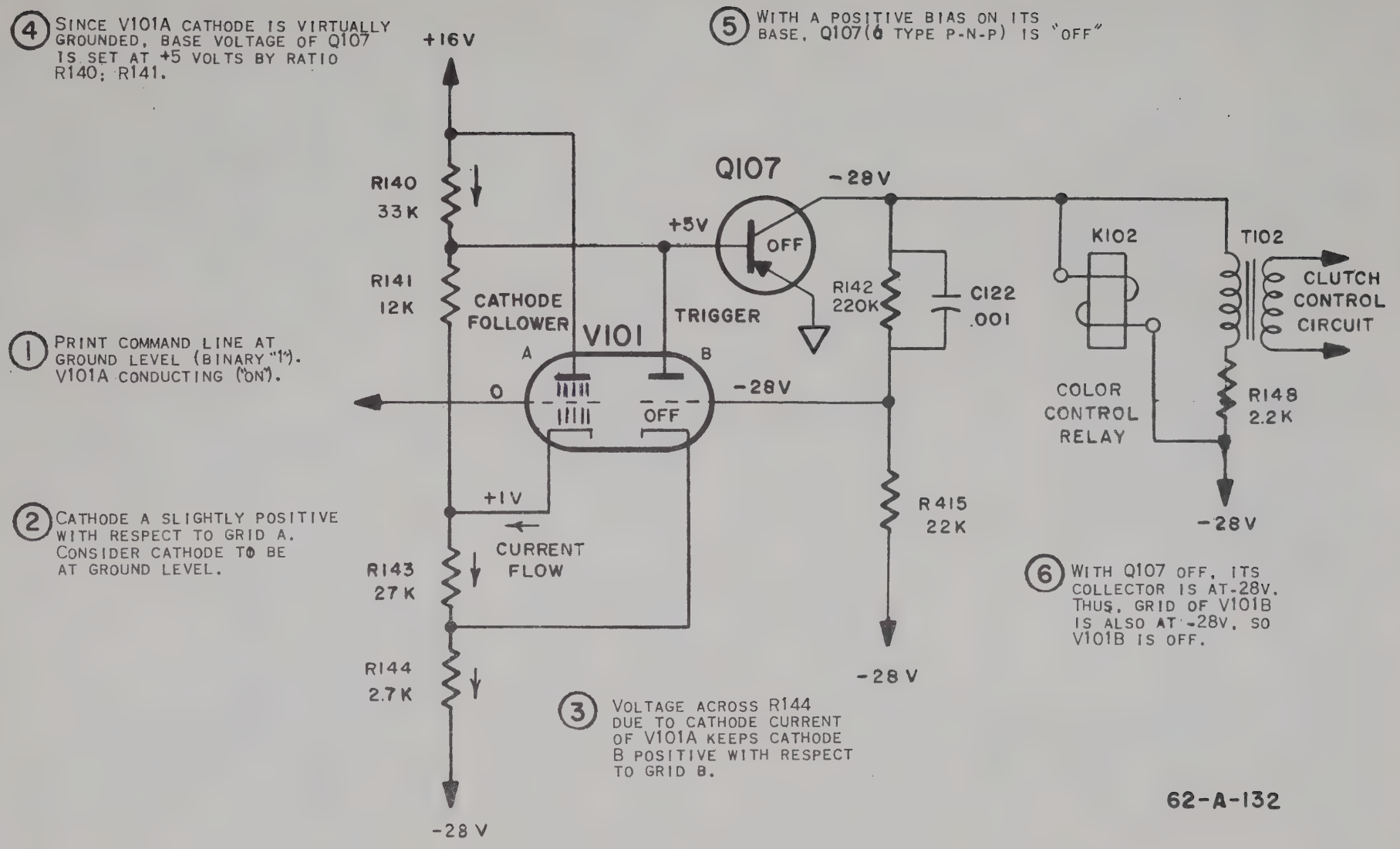

4 SINCE V101A CATHODE IS VIRTUALLY GROUNDED, BASE VOLTAGE OF Q107 IS SET AT +5 VOLTS BY RATIO R140: R141.
5 WITH A POSITIVE BIAS ON ITS BASE, Q107(a TYPE P-N-P) IS "OFF"
+16V
R140 33K
R141 12K
Q107
-28V
+5V
OFF
K102
T102
CLUTCH CONTROL CIRCUIT
R142 220K
C122 .001
CATHODE FOLLOWER
V101
TRIGGER
A
B
0
-28V
OFF
COLOR CONTROL RELAY
R148 2.2K
1 PRINT COMMAND LINE AT GROUND LEVEL (BINARY "1"). V101A CONDUCTING ("ON").
2 CATHODE A SLIGHTLY POSITIVE WITH RESPECT TO GRID A. CONSIDER CATHODE TO BE AT GROUND LEVEL.
+1V
CURRENT FLOW
R415 22K
-28V
R143 27K
R144 2.7K
6 WITH Q107 OFF, ITS COLLECTOR IS AT-28V. THUS, GRID OF V101B IS ALSO AT -28V, SO V101B IS OFF.
3 VOLTAGE ACROSS R144 DUE TO CATHODE CURRENT OF V101A KEEPS CATHODE B POSITIVE WITH RESPECT TO GRID B.
-28 V
62-A-132

FIG. 3-2 Quiescent ("reset") state of the Control Trigger Circuit.

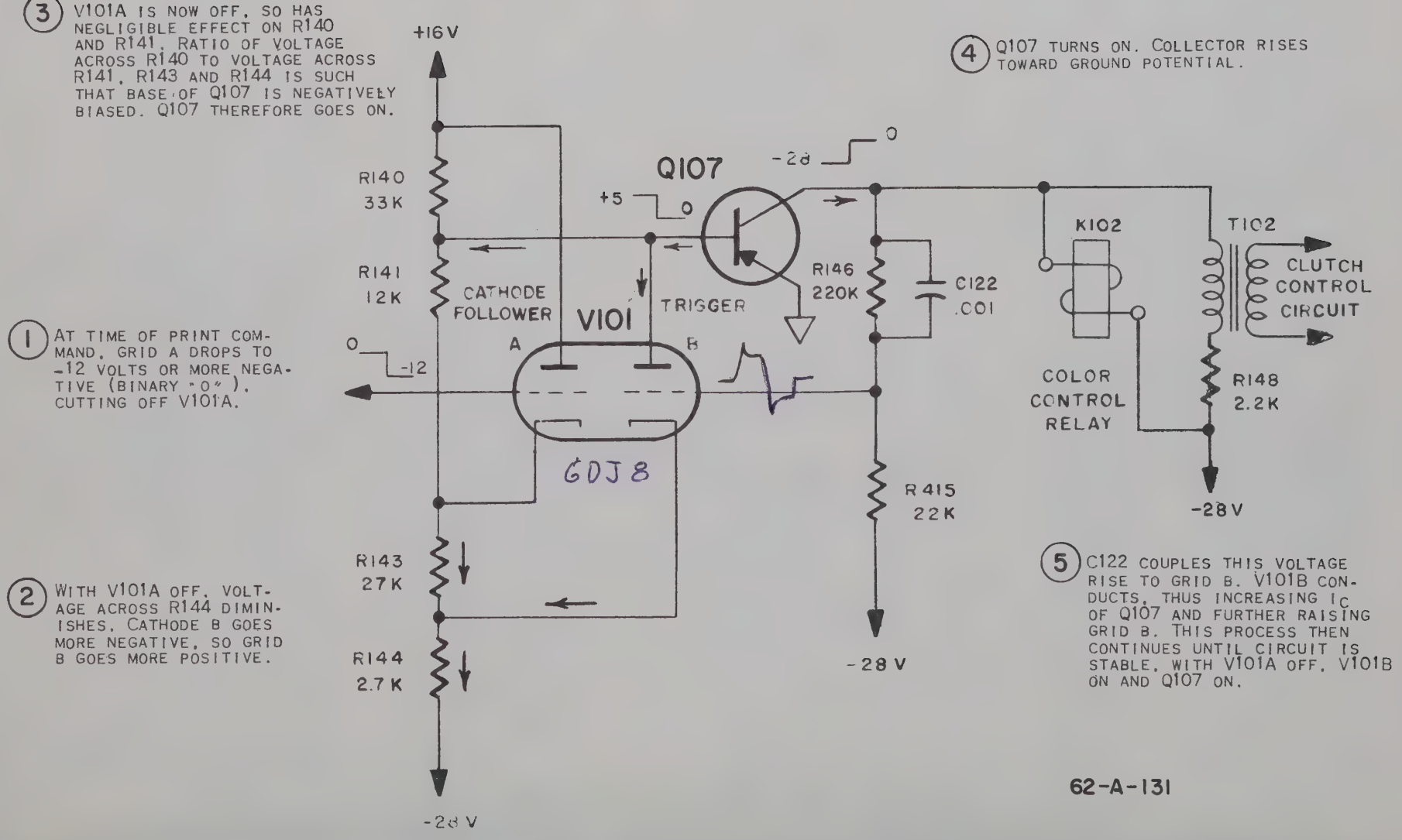


FIG. 3-3 Response of the Control Trigger Circuit to a command. At the end of the command, grid A rises to ground and a reverse process returns the circuit to its reset state.

3.3.3 Control Logic. Figure 3-4 shows the circuit that controls clutch engagement and printed color in response to external commands. Referring to the circled numbers on the illustration, the operating sequence, shown graphically in the timing diagram at the back of the manual, is as follows:

1) In the ready state – that is, before a print command is received – clutch actuator K103 is de-energized. The motor is running with the clutch disengaged, so the printer mechanism is at rest.

2) A print command passes through contact A of K103 to the control trigger, which generates a 28-volt positive output step as shown in Figure 3-3.

3) Transformer T102 differentiates this step, producing a positive pulse at end A and a negative pulse at end B.

4) If the print switch (S102) is in the PRINT position, diode CR117 conducts, returning the base of transistor Q108 to ground through contact C of K103. Since Q108 is of type P-N-P, the negative pulse at its base turns it on. Collector current then flows, energizing K103. As soon as the armature of K103 begins to move, it releases a mechanical trip that engages the clutch. The camshaft then begins to rotate.

5) Contact D of K103 closes. Thus, K103 is latched through resistor R149 and becomes independent of Q108.

6) As the armature of K103 continues its travel, contact C breaks the ground return to the base of Q108, turning off Q108 so that subsequent operation of the control trigger circuit during the color control sequence will have no effect on the clutch control circuit.

7) Contact B of K103 closes, grounding the inhibit reset line. This inhibit reset command is used to prevent reset of the data source before data entry is complete.

8) Contact A of K103 opens, disconnecting the print command line from the control trigger circuit, which now becomes available for the color control function.

9) The color printed is determined by the amount of travel of the ribbon shift mechanism, which moves either the red or the black portion of the ribbon into a position between the type face and the paper for the printing operation. To print red, the ribbon guides are allowed full travel. To print black, however, the movement is restricted by linkages operated manually from the front-panel red/black lever, or electrically by the color selector, K102.

For electrical selection of color, the front-panel lever must therefore be set at red. Then, with binary "1" (0 to +50 volts) on the color control line, the output of the control trigger circuit will be -28 volts, as described in Figure 3-3. Thus, K102 will be de-energized and red will be printed. With binary "0" (-12 to -50 volts) on the color control line, however, K102 will be energized and black will be printed.

Note that K102 is energized by the initial print command and remains energized after contact A of K103 opens (step 8), since the input to the control trigger is held negative by resistor R150, connected to -14 volts through contact A of the cam switch, S103. After rotation of the camshaft has opened S103A, however, the control trigger input voltage rises because R150 is connected to +16 volts through R121. At this time, K102 will be de-energized unless a "print black" signal is present on the color control line.

10) When data entry is complete – about half way through the mechanical cycle – S103A closes again, but the change from ground to negative at the control trigger input does not have any effect on the clutch actuator, since contact C of K103 is still open (see step 6).

11) The aligner arm now locks the type bars in their selected positions, at the same time pressing the armature of K103 into the de-energized position, unlatching K103. The control circuit is again able to accept a print command, and the external source is free to provide new data. However, the clutch remains engaged until the end of the cycle, by which time the data have been printed and the type bars restored to their starting position.

Since the input to the control trigger circuit is already held negative through R150 and S103A, the closing of K103A cannot produce a false print command. The input needs to be raised to ground level or above and then dropped below the triggering level before the clutch control circuit will respond.

12) If a new print command arrives before the cycle is complete, the mechanism does not stop at the end of the cycle. Instead, the command will trigger the clutch actuator so that the clutch remains engaged.

3.4 POSITION TRANSDUCER

Combining the inherent reliability of the electronic transducer and the simplicity of the mechanical commutator, the position transducer, shown in Figure 3-5, is a mercury-wetted DPST switch, sealed in a capsule that is filled with inert gas under high pressure. The mercury ensures bounce-free contact, permitting the transducer to be connected directly to the electronic circuits without the need for pulse shaping.

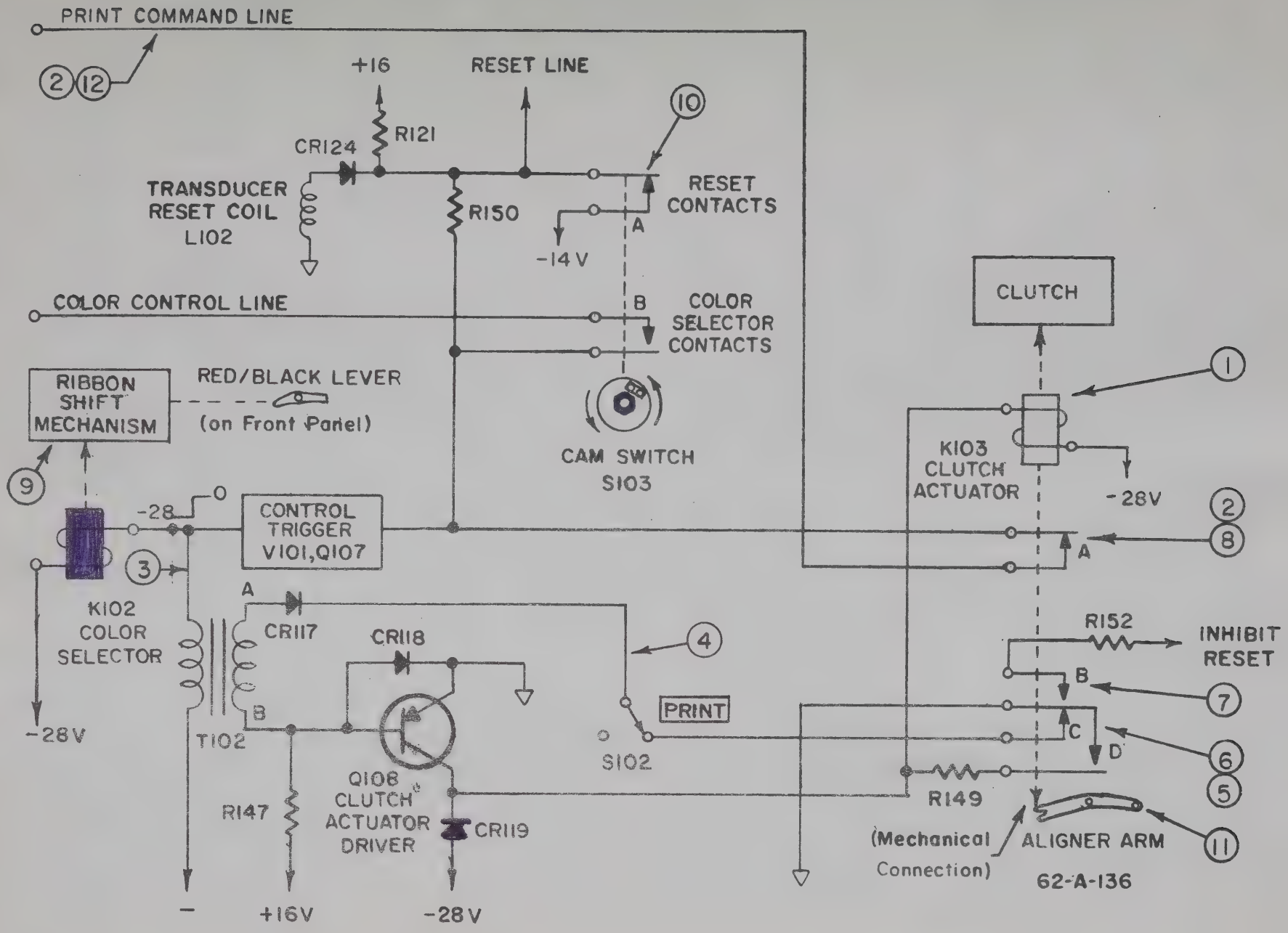


FIG. 3-4 Control Circuit, simplified. The circled numbers refer to the description in Section 3.3.3.

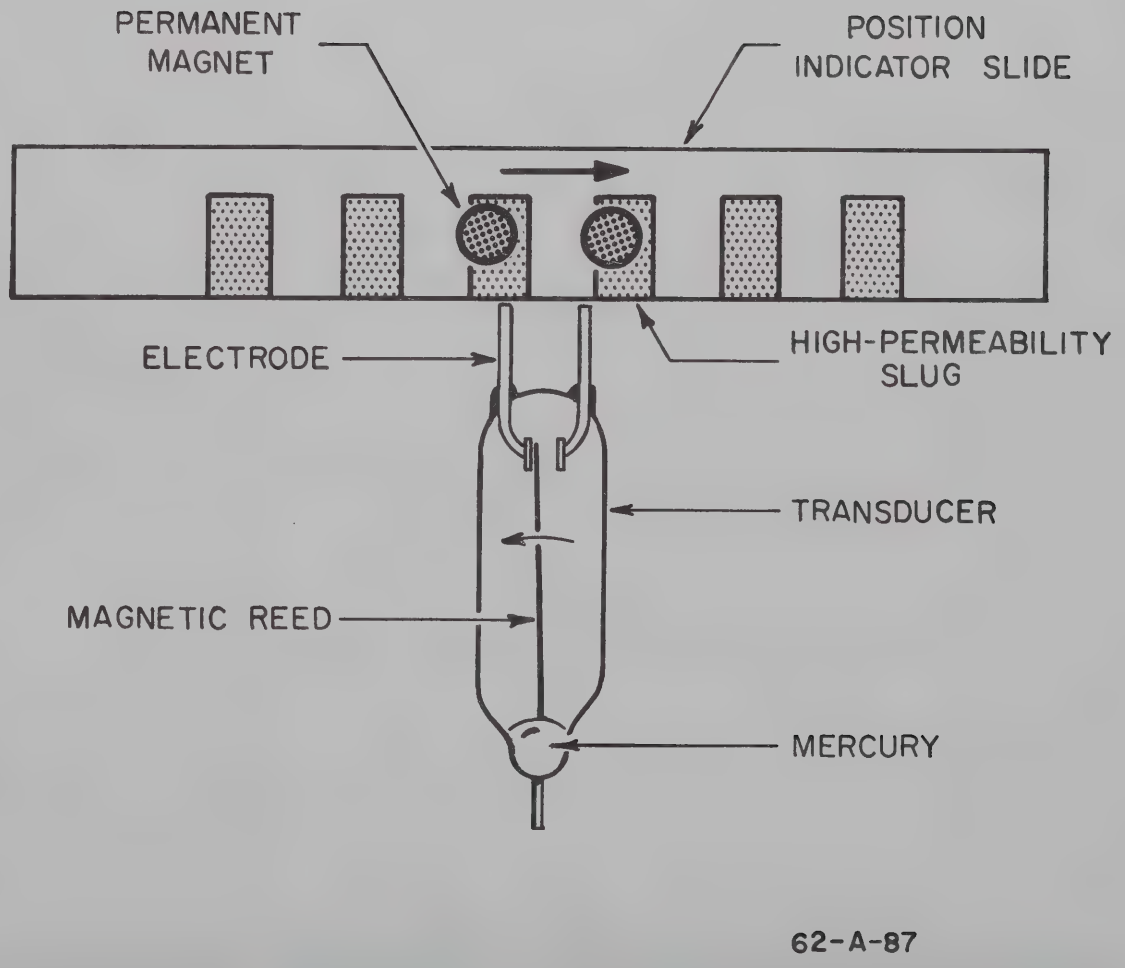


FIG. 3-5 Position transducer.

Two permanent magnets, one opposite each electrode, establish a symmetrical field near the electrodes. Attached to the excursion control bar, the position indicating slide places magnetic slugs between the magnets and the electrodes, distorting the field so that the magnetic reed of the transducer is attracted to the nearest slug. The spacing of the magnets and slugs is such that the reed switches from one electrode to the other for each decimal position of the type bars, generating the first place of a four-line BCD position code. At the same time, signals from one electrode trigger the flip-flop chain of the code generator, which then provides the other three places of the position code.

3.5 INPUT CODE MODULES

3.5.1 General Design Features. Two kinds of input code modules are available for the Model 1453: a four-line module for BCD data of 1-2-2-4, 1-2-4-2, and 1-2-4-8 weighting, and a ten-line module accepting both ten-line and four-line data. (To the 1453, 1-2-4-2 and 1-2-4-8 are the same). Each module can be plugged into any of twelve sockets, numbered "1" through "12" to correspond to the positions of the digit columns. Up to 12 digits of coded data, each coupled to an individual numbered connector on a flexible cable, can then be plugged into the modules in any order. Thus, the operator can place the digits in any order on the printed line.

3.5.2 Four-Line Input Code Module. A solid-state device, the BCD module consists of a first coincidence comparator, a two-stage trigger circuit (Q201, Q203) and a pawl magnet driver (Q202) as shown in Figure 3-6.

Clock pulses generated for each position of the type bar assembly are applied to the trigger circuit through an attenuator whose attenuation factor is high when any coincidence diode (CR201, CR203, CR206, or CR208) is conducting, and low when all four diodes are non-conducting. At the anodes of the diodes are the four lines of BCD data from the external input source; at the cathodes are the four lines of similarly coded data from the code generator. As long as the decimal digits represented by the two data sources are different, at least one of the diodes is conducting. Consequently, the clock pulses are attenuated to about +5 volts, too small to affect the trigger circuit. During this quiescent condition, the trigger is in the reset state, which keeps Q202 in conduction. Since the collector of Q202 is returned to -14 volts through the pawl magnet, the magnet is energized and the stop pawl is held clear of the type bar.

When the input data and the position data coincide, however, all four diodes are non-conducting. Consequently, a clock pulse arriving at that time is able to attain enough amplitude to switch the trigger circuit

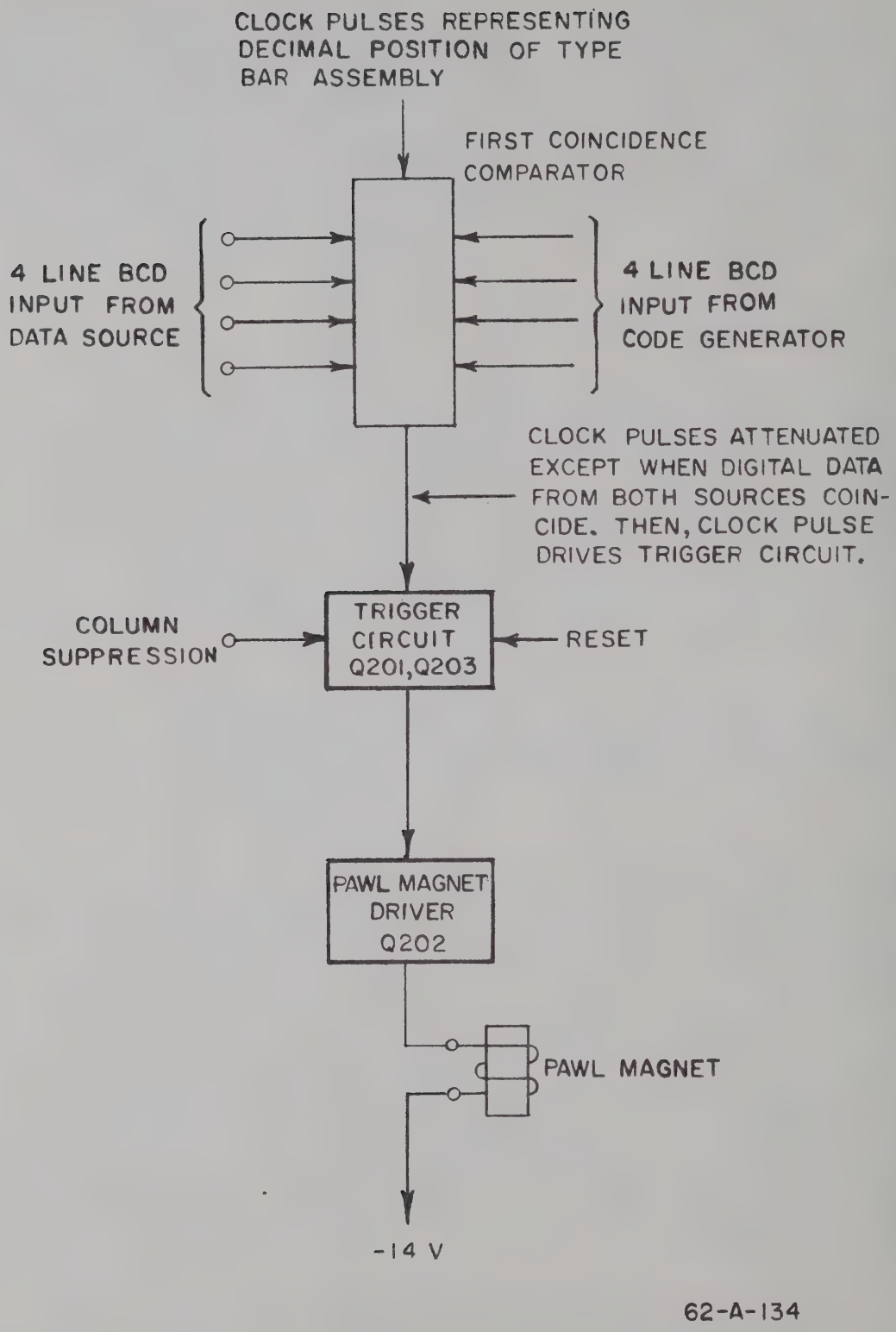

CLOCK PULSES REPRESENTING DECIMAL POSITION OF TYPE BAR ASSEMBLY
FIRST COINCIDENCE COMPARATOR
4 LINE BCD INPUT FROM DATA SOURCE
4 LINE BCD INPUT FROM CODE GENERATOR
CLOCK PULSES ATTENUATED EXCEPT WHEN DIGITAL DATA FROM BOTH SOURCES COINCIDE. THEN, CLOCK PULSE DRIVES TRIGGER CIRCUIT.
COLUMN SUPPRESSION
TRIGGER CIRCUIT Q201,Q203
RESET
PAWL MAGNET DRIVER Q202
PAWL MAGNET
-14 V
62-A-134

FIG. 3-6 Logic of the four-line BCD Input Module.

to its other stable state, turning off Q202 and allowing the stop pawl to drop. During the restoring part of the printing cycle, a contact closure in the cam switch resets the trigger, turning Q202 on again and restoring the holding current in the pawl magnet.

Since each pawl magnet derives its holding current from the corresponding input module, removal of the module de-energizes the magnet. Consequently, as soon as the mechanical lock on the magnet armatures is released at the beginning of a printing cycle, the stop pawl of any de-energized magnet drops, latching its type bar in the "no-print" position. This column suppression feature thus automatically ensures that no data will be recorded in any digit column that does not have an input module. Column suppression can also be controlled remotely by a contact closure to power ground from one pin on the top connector of any module. Grounding this pin switches the trigger in the module to the state that turns off transistor Q202, allowing the stop pawl to drop when the reset signal is removed at the beginning of the cycle.

3.5.3 Ten-Line Input Code Module. In the ten-line input code module, a diode matrix first translates the decimal input data into four-line BCD data, weighted 1-2-2-4 or 1-2-4-8 according to the position of a switch on the module. From this point on, the circuit is the same as that of the four-line module.

Since the ten-line module accepts both ten-line data and BCD data, a printer fitted with these modules is able to record both types of information on one line.

3.6 PAWL MAGNETS AND STOP PAWLS

Replacing the manually operated listing, or numeral, keys of the standard adding machine, the pawl magnet assembly controls the type bars: one pawl magnet, one stop pawl, and one input code module to each type bar.

During the indexing movement of the type bars, each input code module is comparing BCD data from the code generator with BCD data from the external source. As soon as the two sources coincide, indicating that the type bar is in the correct decimal position, the holding current for the corresponding pawl magnet is cut off. The stop pawl then drops into a notch on the type bar, stopping further movement.

Figure 3-7 shows a cross section of the pawl magnet assembly with one stop pawl in the holding position and another stop pawl released. Typical drop-in time for a pawl is 3 milliseconds.

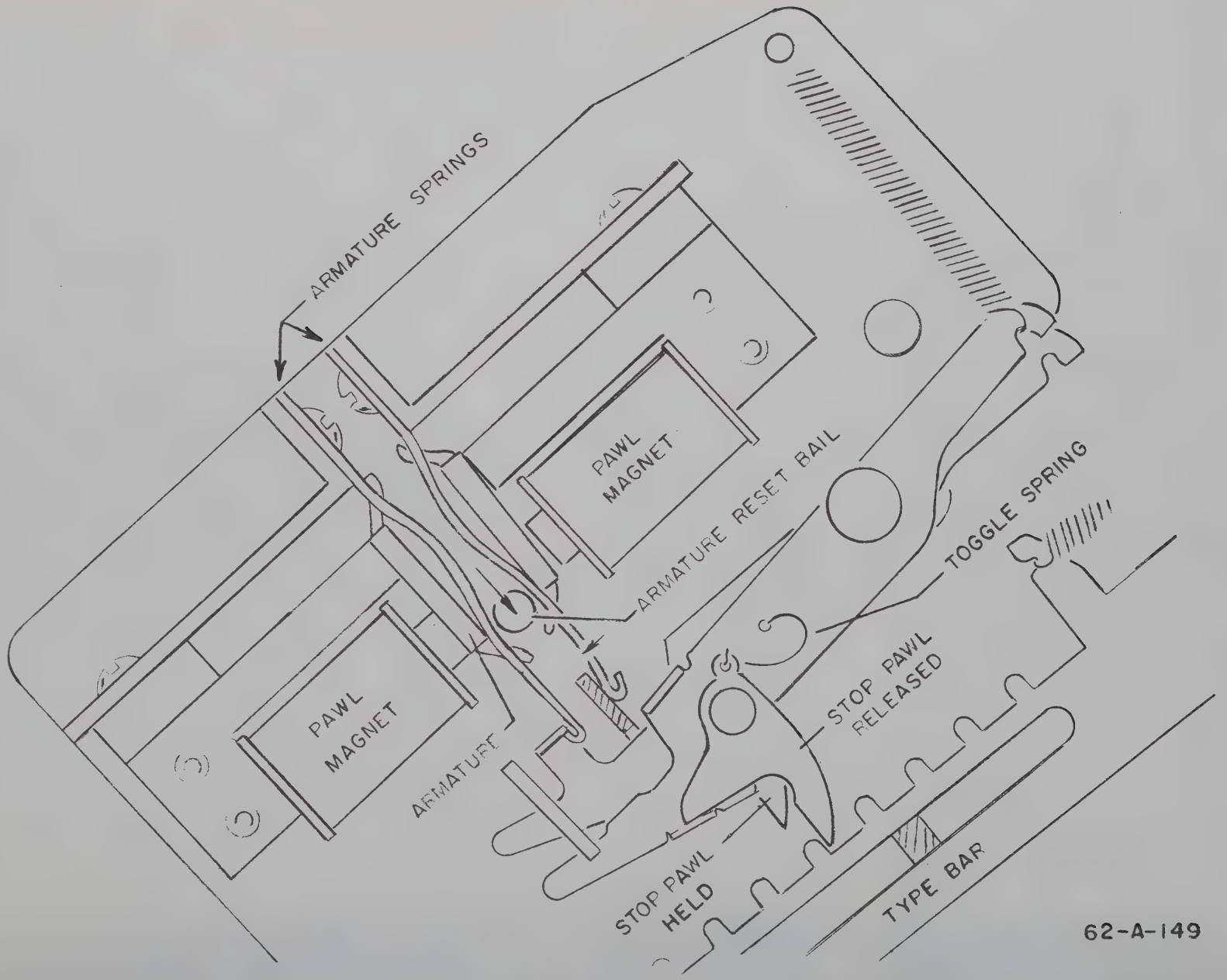


FIG. 3-7 Cross section of the pawl magnet assembly, showing two of the pawl magnets and stop pawls.

3.7 RESETTING AND RESTORING

As part of the over-all requirement of keeping the electronic control circuits at low power levels, the resetting and restoring actions have been designed to derive their power entirely from mechanical linkages.

Since the type bars are latched in their various decimal positions by stop pawls during indexing, they have to be unlatched during restoration. To permit this, each pawl is hinged backward on its pawl arm, as shown in Figure 3-7, and is snapped out of engagement by a toggle spring when the type bar starts its restoring travel.

Near the end of the cycle, the pawl arms are raised by mechanical linkage, turning the pawls upright. After the pawl arms are fully raised, the armature reset bail presses the magnet armatures against the magnet pole pieces, engaging each armature spring catch under its pawl arm. The bail remains in this position at the end of the cycle, but the pawl arm restoring linkage returns before the end. Because of this two-sequence reset action, the power needed by the magnets can be kept at a minimum: just enough to enable each magnet to hold its armature.

To make sure that the position transducer is in the correct starting position for the next cycle of operation, a reset coil (L102) on the transducer is energized through a cam switch (S103) at the beginning of the restoring action. By locking the transducer reed during restoration, the magnetic field of the coil also saves needless wear of the transducer contacts, thus extending their life.

3.8 CODE GENERATOR

3.8.1 Design of the code Generator. Comprising the position transducer and three binary, or flip-flop, stages (Q101 and Q102, Q103 and Q104, Q105 and Q106), the code generator produces four-line BCD signals representing the decimal position of the type bar assembly.

As shown in Figures 3-8 and 3-9, a diode gate (CR113) and a feedback loop convert what would otherwise be a scale-of-sixteen counter into a decimal counting circuit.

Two diodes, CR110 and CR111, determine the weighting of the four-line code. With the code control line ungrounded, CR110 connects the feedback loop from Q103 to Q102 for a 1-2-2-4 code. When the line is grounded, CR111 switches the loop from Q105 to Q102, changing the weighting to 1-2-4-2 for a 1-2-4-2 or a 1-2-4-8 input code (both of these weights are the same in the logic of the 1453).

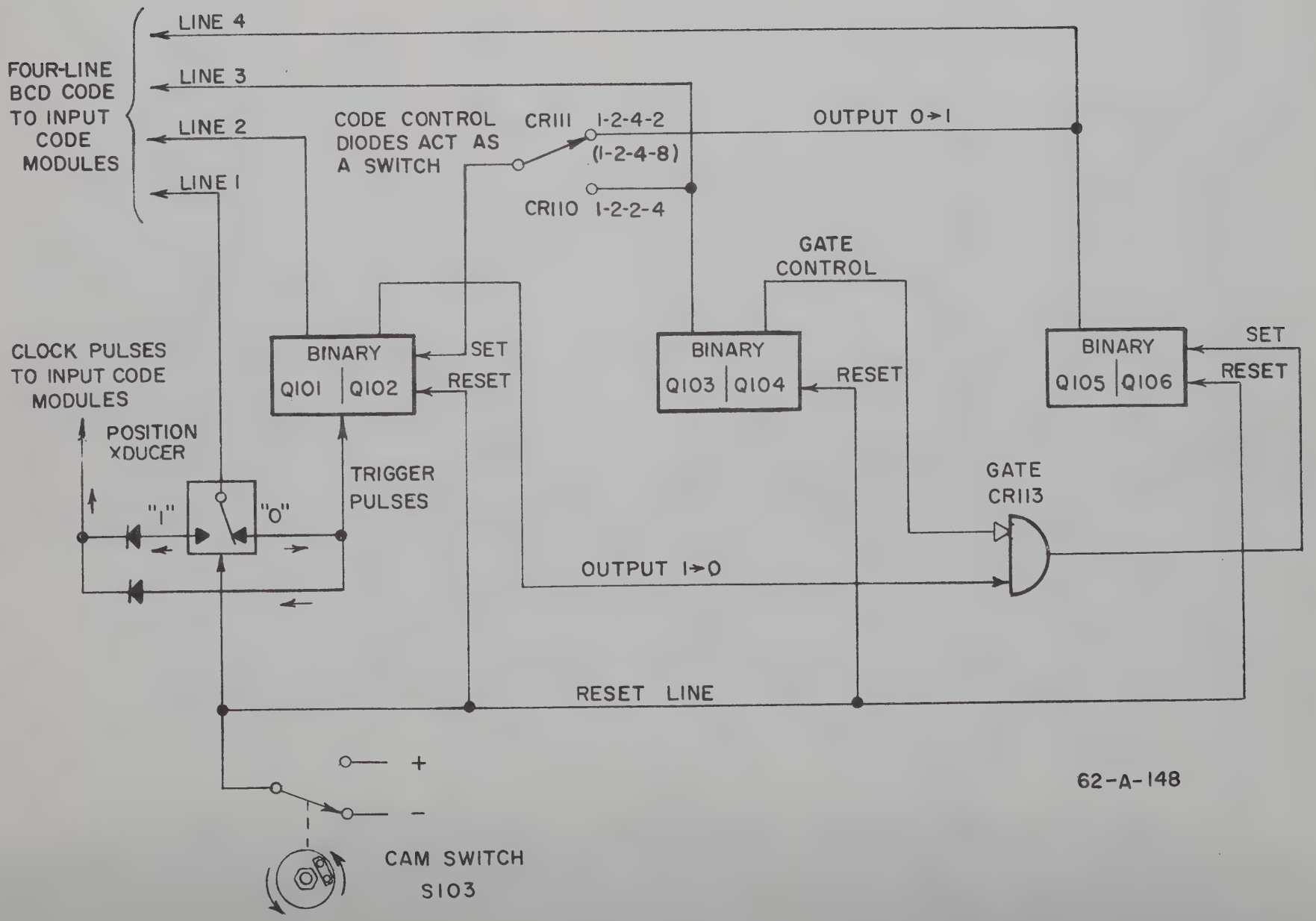


FIG. 3-8 The code generator produces four-line BCD signals representing the decimal position of the type bar assembly. Note that 1-2-4-2 and 1-2-4-8 are the same in this logic.

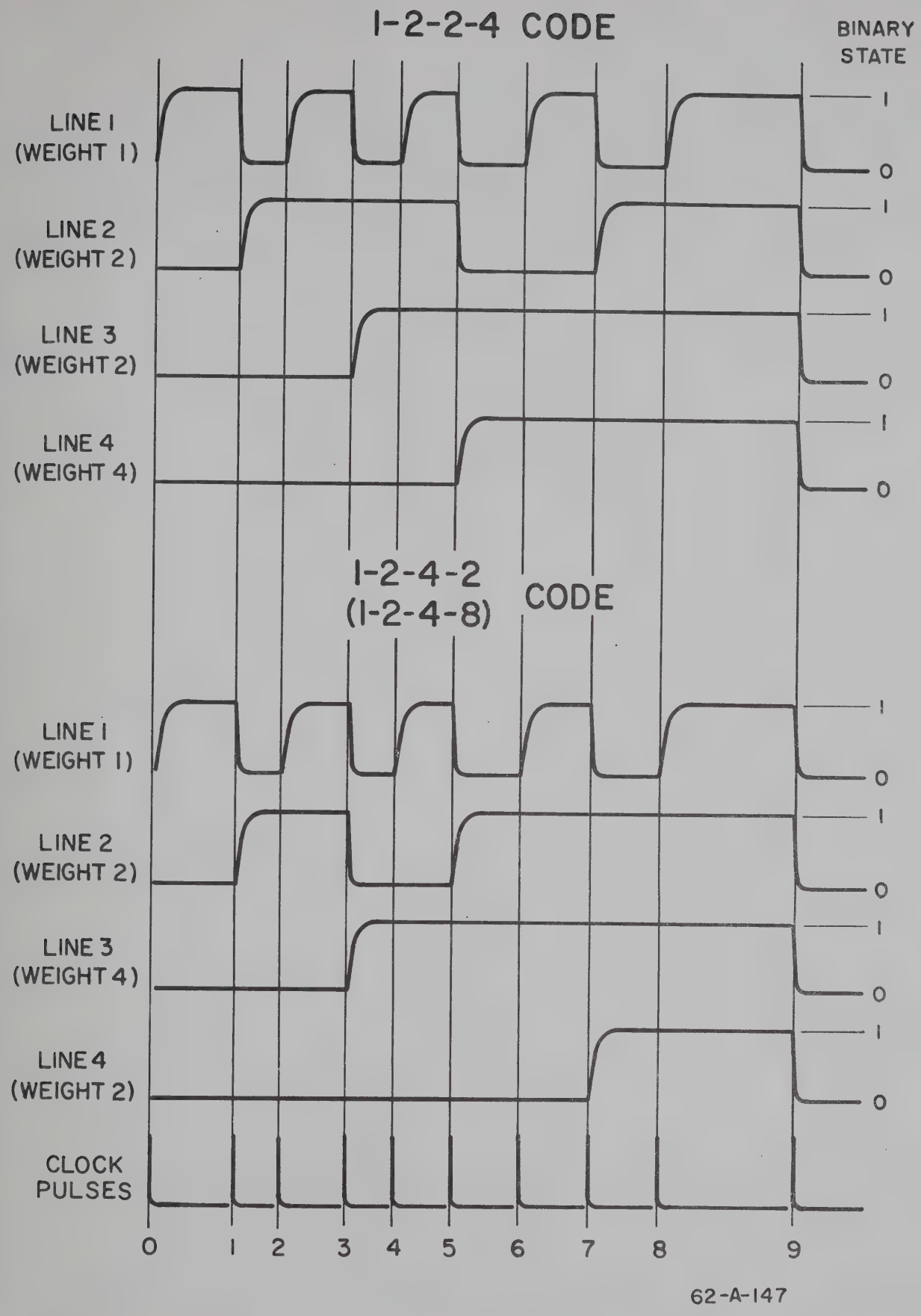
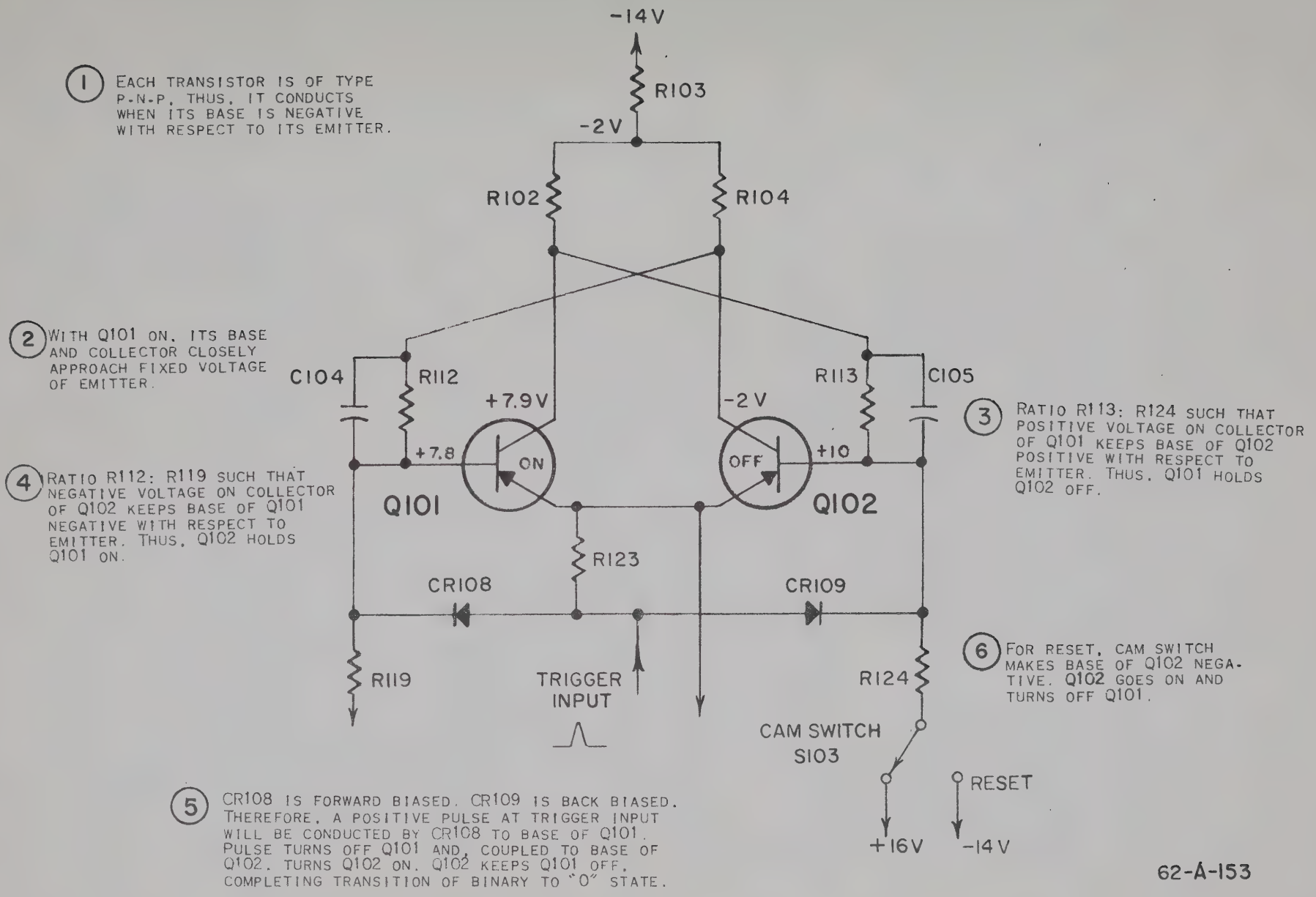


FIG. 3-9 BCD outputs of the code generator. The uneven clock pulse spacing is due to acceleration and deceleration of the printer mechanism.

3.8.2 The Binary Circuit. A typical binary stage in the code generator is a pair of p-n-p transistor amplifiers with the collector of each coupled to the base of the other. Being symmetrical, the circuit can exist in either of two stable states in which one transistor is conducting while the other is cut off. Figure 3-10 shows one of the binaries and describes how positive pulses from the position transducer switch the circuit from one stable state to the other.



(1) EACH TRANSISTOR IS OF TYPE P-N-P, THUS, IT CONDUCTS WHEN ITS BASE IS NEGATIVE WITH RESPECT TO ITS EMITTER.

(2) WITH Q101 ON, ITS BASE AND COLLECTOR CLOSELY APPROACH FIXED VOLTAGE OF EMITTER.

(3) RATIO R113: R124 SUCH THAT POSITIVE VOLTAGE ON COLLECTOR OF Q101 KEEPS BASE OF Q102 POSITIVE WITH RESPECT TO EMITTER. THUS, Q101 HOLDS Q102 OFF.

(4) RATIO R112: R119 SUCH THAT NEGATIVE VOLTAGE ON COLLECTOR OF Q102 KEEPS BASE OF Q101 NEGATIVE WITH RESPECT TO EMITTER. THUS, Q102 HOLDS Q101 ON.

(5) CR108 IS FORWARD BIASED. CR109 IS BACK BIASED. THEREFORE, A POSITIVE PULSE AT TRIGGER INPUT WILL BE CONDUCTED BY CR108 TO BASE OF Q101. PULSE TURNS OFF Q101 AND, COUPLED TO BASE OF Q102. TURNS Q102 ON. Q102 KEEPS Q101 OFF. COMPLETING TRANSITION OF BINARY TO "0" STATE.

(6) FOR RESET, CAM SWITCH MAKES BASE OF Q102 NEGATIVE. Q102 GOES ON AND TURNS OFF Q101.

FIG. 3-10 A typical binary in the code generator. The circuit is shown in the "1" state.

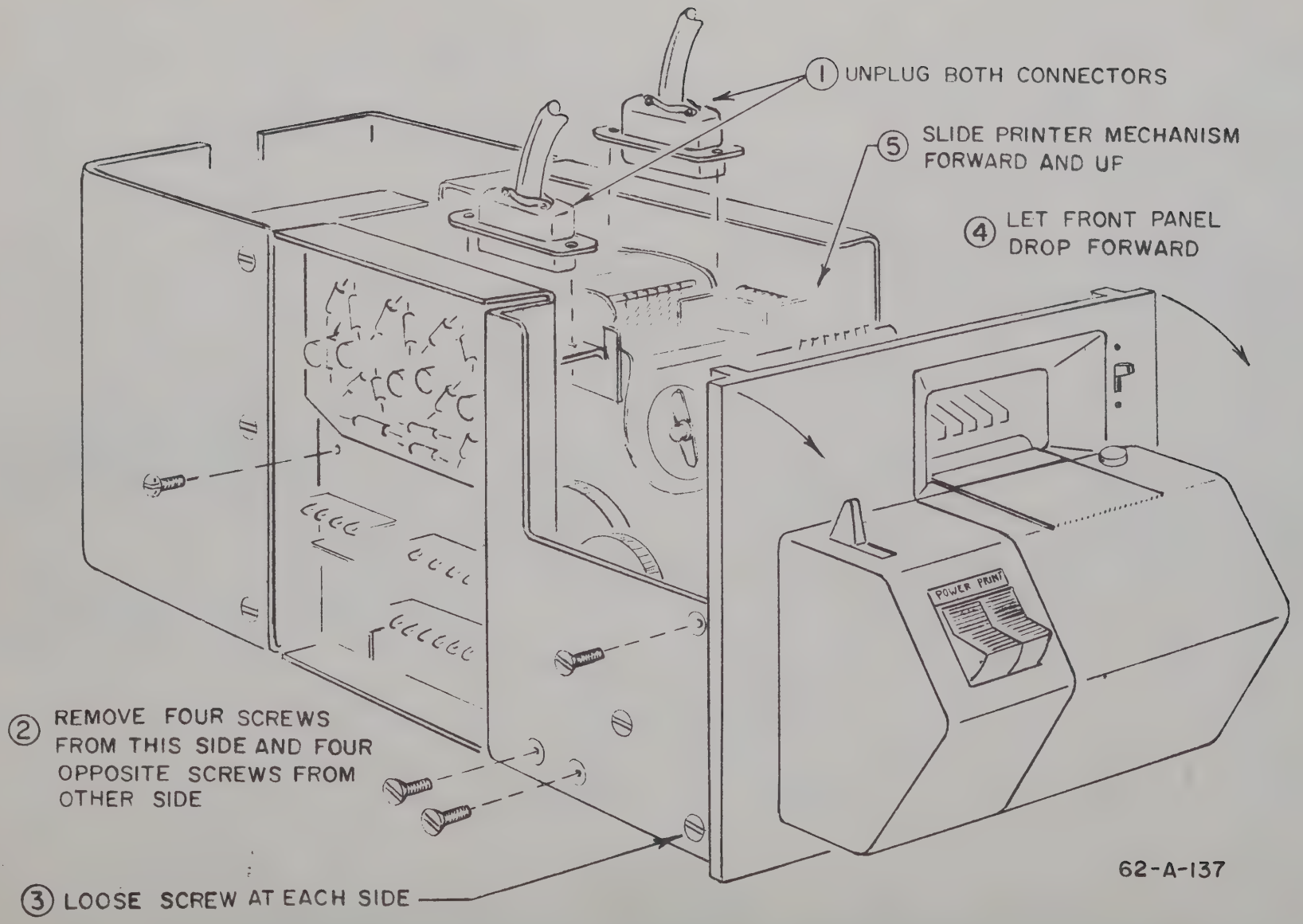

1 UNPLUG BOTH CONNECTORS
5 SLIDE PRINTER MECHANISM FORWARD AND UP
4 LET FRONT PANEL DROP FORWARD
POWER PRINT
2 REMOVE FOUR SCREWS FROM THIS SIDE AND FOUR OPPOSITE SCREWS FROM OTHER SIDE
3 LOOSE SCREW AT EACH SIDE
62-A-137

FIG. 4-1 To remove the Printer mechanism from the rest of the Printer, follow the steps shown.

SECTION 4

SERVICING

4.1 PREPARING THE PRINTER FOR SERVICING

4.1.1 Removing the Printer from its Case. To remove the portable case, pull out the catch on each side of the case, near the bottom, then slide the case back and up.

To remove the printer from its rack adapter or bench cabinet, give a quarter turn counterclockwise to the two screws below the paper compartment; then slide the printer forward.

4.1.2 Removing the Printer Mechanism. For most of the mechanical servicing procedures described in this section, you will need to remove the printer mechanism, as shown in Figure 4-1.

4.1.3 Manually Operating the Printer Mechanism. When servicing the printer, it is often necessary to cycle the mechanism by hand, as follows:

1) After removing the mechanism (see Figure 4-1), turn its left side toward you. Between the side plate and the pawl magnet assembly you will find the mechanical trigger shown in Figure 4-2.

2) Press upward the lever indicated in Figure 4-2. The clutch will then engage.

3) To drive the mechanism through one cycle, rotate the large nylon gear in the gear train counterclockwise (the gear engages with the drive motor pinion).

4.2 TROUBLESHOOTING

4.2.1 Aids to Troubleshooting. A good first step in troubleshooting the printer is to study Section 3, as well as the Timing Diagram in the schematic section, so as to gain a thorough understanding of the circuit logic. Refer then to Section 4.3, which summarizes possible troubles and their causes.

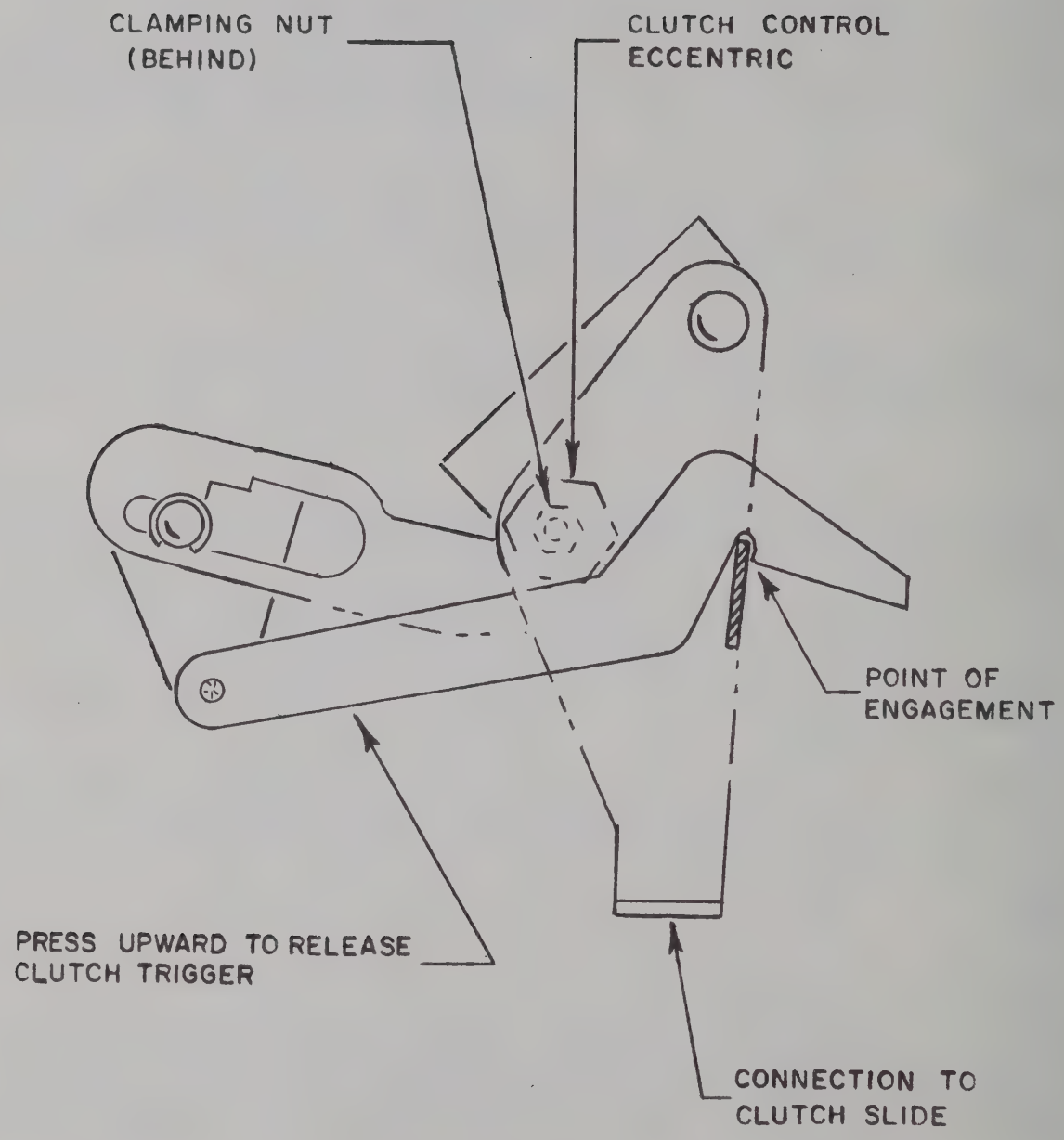


FIG. 4-2 To adjust the clutch control eccentric, follow the steps in Section 4. 4. 1 while referring to this illustration.

4.3 POSSIBLE FAULTS IN OPERATION

4.3.1 Print Command does not Start Cycle. If a print command does not start a printing cycle, follow this procedure:

1) Make sure that the print switch is in the PRINT position.

2) See whether the print command is reaching the control trigger circuit. Watch the color selector, K102. Even with the print switch at "standby", K102 should be energized when the print command line is negative, and de-energized when the line is positive.

3) Measure the voltage at pin 7 of V101. It should be identical to the print command line input.

4) Continuity-check the print command line up to pin 5 of connector "C".

5) Check the cam switch adjustment as described in Section 4.4.3.

6) Measure the signal at the collector of Q107. The collector should be at ground when the print command line is negative, and at -28 volts when the line is positive.

7) Replace V101.

8) Check Q107. First, connect pin 8 of V101 to +16 volts: the collector should be negative. Next, remove V101: the collector should be between -10 volts and ground. If not, replace Q107.

9) Check the clutch actuator driver, Q108. First, using a scope, see what happens at the collector of Q108 when a print command occurs: the collector must move to ground for at least 20 milliseconds. If it does not, contacts on K103C (Fig. 3-4) may need adjustment or or cleaning; Q108 or T102 may be defective.

10) See whether K103 is being actuated. Ground the collector of Q108 through a 100 ma meter: the clutch should operate the mechanism continuously with a current of 80 ma flowing. If current does not flow, the winding of K102 is open, or there is a break in the wiring to K103. If current is flowing and K103 is energized, the clutch actuating mechanism is out of adjustment.

4.3.2 Single Print Command Produces more than One Cycle. When a single print command produces more than one cycle of operation, the cause may be electrical or mechanical. To find the cause, go through this procedure:

1) While the mechanism is in one of the unwanted cycles, press the PRINT switch to "standby". If the printer stops at the end of that cycle, the problem is electrical.

2) With the POWER switch off, cycle the mechanism by hand while watching the operating sequence of the type alignment bar and the reset contacts (the lower set) on the cam switch. The contacts must be fully closed and separated from the cam one half turn of the plastic gear before the type alignment bar touches the clutch actuator. To adjust the timing, see Section 4.4.3.

3) Repeat step 1. If K103 is energized and switching to standby does not stop operation, either the type alignment bar does not press the armature of K103 far enough to break the latching contacts, or Q108 has excessive collector leakage. First, pull out connector P102 (at left front of mechanism) to stop the motor. Give a single print command to energize K103, then operate the mechanism by hand until the type alignment bar presses the armature of K103. The motion should be enough to press the armature against the frame of the magnet, releasing the magnet, which should then remain de-energized.

   If the mechanical action is correct, remove connector P101 (on the pawl magnet assembly) and press the PRINT switch to "standby" (IMPORTANT) to prevent actuation of Q108. Place a milliammeter between the collector of Q108 and the -28 volt supply to determine leakage. At high line voltage (135 volts rms) the leakage must not exceed 50 microamps at 25° C. If greater, replace Q108.

4) Repeat step 1. If the clutch actuator is de-energized and the cycle continues, turn off the printer and check the adjustment of the clutch control eccentric, as described in Section 4.4.1 If this appears correct, try increasing the spring tension on the clutch trigger by pulling the spring sideways (the spring runs from the trigger to the actuator frame). If operation improves, shorten the spring slightly, but make sure that the mechanism works well at low line voltage (95 volts rms).

4.3.3 One or More Columns do not Print. If one or more columns wrongly produce a blank impression, follow these steps:

1) Make sure that no modules are upside down or loose in their sockets.

2) Rule out the possibility of a defective module by replacing the suspected module with one from a correct column.

3) Check whether the input data are changing after the print command. They should not.

4) Remove the input connector from the module in the faulty column, then operate the printer. The column should print a random number. If it produces a blank impression, the pawl magnet for that column may be out of position. Adjust the magnet as described in Section 4.4.4.

4.3.4 No Columns Print If all columns wrongly produce a blank impression, follow these steps:

1) Measure all supply voltages to rule out failure of the power supply.

2) Check the reset line: it should be at -14 volts when the mechanism is in the rest position. Reset failure may be due to wrong adjustment of the cam switch. Figure 4-4 shows the correct adjustment.

3) Make sure that the input data do not change after print command.

4) Inspect the pawl magnet assembly: the mechanism may be jammed so that the stop pawls do not reset. Operate the mechanism by hand, making sure that the pawl reset link (right side, internal) advances and suddenly retracts near the end of the cycle, actuating the pawl reset bail. The overtravel spring should not operate.

5) The pawl reset link may not be in place on the cam actuating lever. Replace the link over the end of the lever. Then check that there is a small coil spring running down and back from the lever to the side plate. If the spring is missing, replace it.

4.4 MECHANICAL ADJUSTMENTS

4.4.1 Clutch Control Eccentric. When a single print command produces more than one cycle of operation, the clutch control eccentric may be out of adjustment. If the troubleshooting procedure in Section 4.3.2 indicates that this eccentric needs adjustment, follow these steps while referring to Figure 4-2.

1) Manually operate the printer through one cycle until the clutch slide has moved to its most rearward position.

2) Loosen the clamping nut.

3) Turn the eccentric so that the clutch trigger engages with a minimum of overtravel of the clutch slide. Movement of the slide from its extreme position to its normal cocked position should be less than .030 in.

4.4.2 Clutch Slide Eccentric. The clutch slide eccentric should be adjusted after the clutch control eccentric (see Section 4.4.1). Make the adjustment so that .005 in. interference occurs between the eccentric and the spring loaded lever that bears on it, as shown in Figure 4-3.

4.4.3 Cam Switch. You can adjust the cam switch timing by moving the cam on its shaft. To make this adjustment, refer to Figure 4-4 and follow these steps:

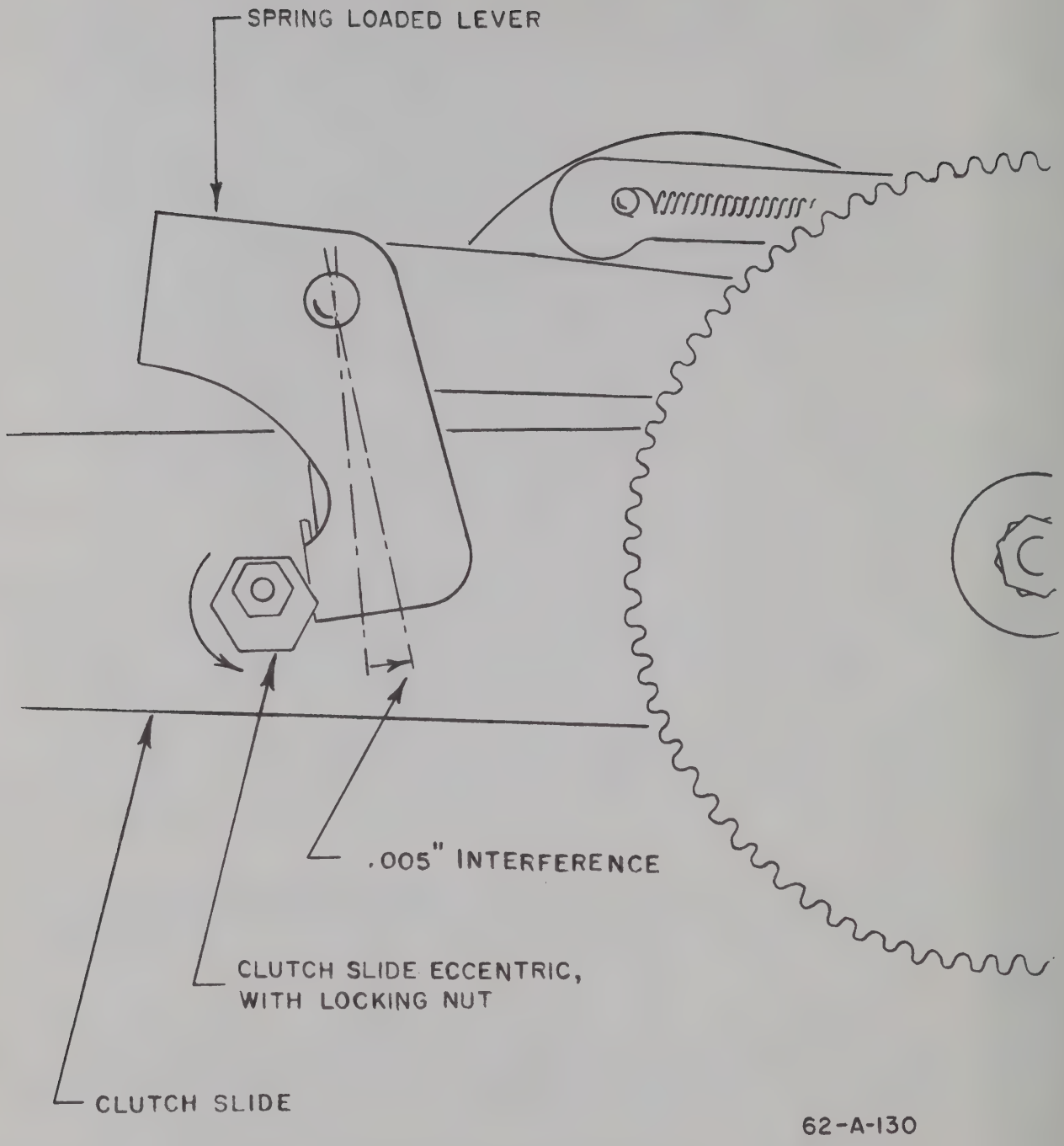


FIG. 4-3 The clutch slide eccentric is adjusted as described in Section 4.4.2.

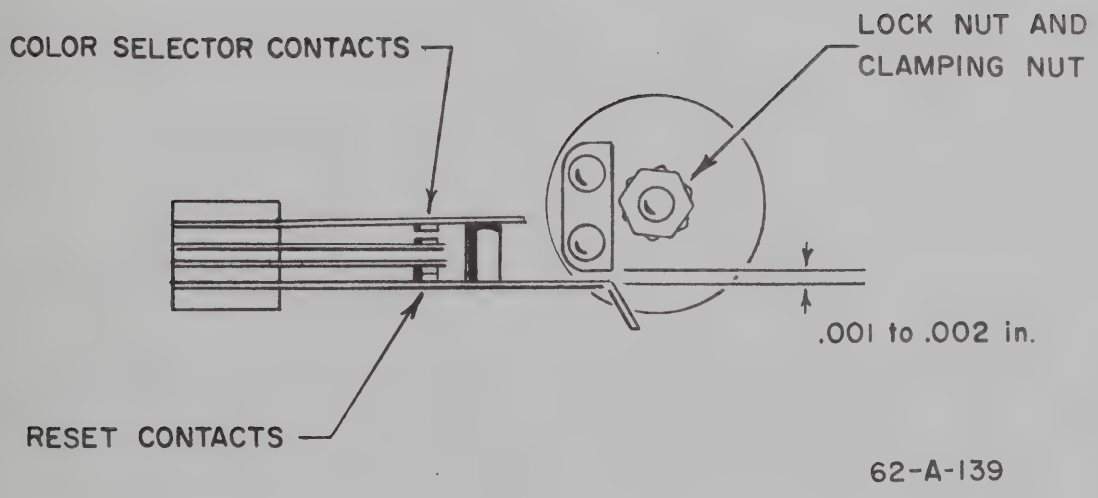


FIG. 4-4 Correct adjustment of the cam switch at the normal rest position (see Section 4. 4. 3).

1) Loosen the lock nut and the clamping nut.

2) Rotate the cam so that in the normal rest position the cam clears the follower leaf by .010 to .020 in. Correct adjustment is shown when the reset contacts do not open with normal overtravel of the shaft but open before the excursion control bar begins to move as the machine is cycled.

4.4.4 Pawl Magnet Position. Located on top of the type bars, the pawl magnet assembly comprises either 8 or 12 pawl magnets arranged in pairs as shown in Figure 4-5 (See Figure 3-7 also). Each pair is held to the magnet frame by two screws, each in a slot.

If the trouble shooting procedure in Section 4.3.3 indicates that a pawl magnet is out of position, follow these steps while referring to Figure 4-5:

1) Loosen, but do not remove, the pair of screws holding the suspected magnet.

2) With power off and the mechanism in the rest position, gently move the magnet until you feel it touch the armature.

3) See that both magnets of the pair are properly centered on their armatures. The illustration shows right and wrong adjustments. Clearance between the magnet cores and the armatures should be essentially zero in the reset (rest) position, but no significant force should be exerted on the armatures by the cores.

4) Tighten the clamping screws.

5) Make sure the machine is printing correctly, then lock the screws with Glyptol or a similar substance.

4.5 LUBRICATION PROCEDURE

4.5.1 General Procedure. To keep the Printer in good running order, lubricate the mechanism every 500,000 impressions, or every six months.

Before applying the lubricants, carefully clean the bearings and surfaces. Since oil dissolves grease, you should make sure that oil does not run onto greased surfaces. Therefore, oil first (Section 4.5.2), wipe off all excess, then apply grease (Section 4.5.3).

4.5.2 Oiling. Mechanical parts with enclosed bearing surfaces need lubrication with a good grade of light machine oil at the interval stated in Section 4.5.1. Included in these parts are levers and rollers on shafts, as well as sliding members in close fitting guides.

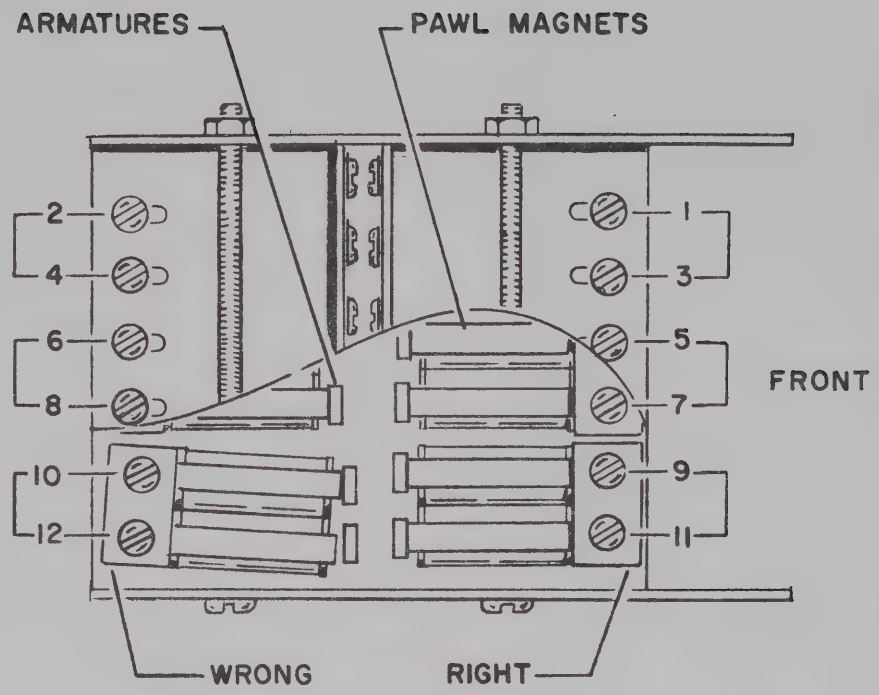


FIG. 4-5 Internal arrangment of the pawl magnet assembly as seen from above the Printer (for a side view of the assembly, see Figure 3-7). The numbers 1 through 12 correspond to the digit columns, reading from right to left across the paper tape. To adjust a magnet position, follow the steps in Section 4. 4. 4.

4.5.3 Greasing. At the interval stated in Section 4.5.1, apply a high grade grease, such as Lubriplate No. 2, to cam surfaces, loose-fitting sliding members, gear teeth, and the needle bearing of the main camshaft.

The bearings of the drive motor are packed and sealed at the factory and require no maintenance.

MODIFICATION H

Printers with this modification are designed to operate on a line voltage of 230 volts ac, which must be 50 cps. As shown in the box on the Master Schematic Diagram, the modification comprises the following changes:

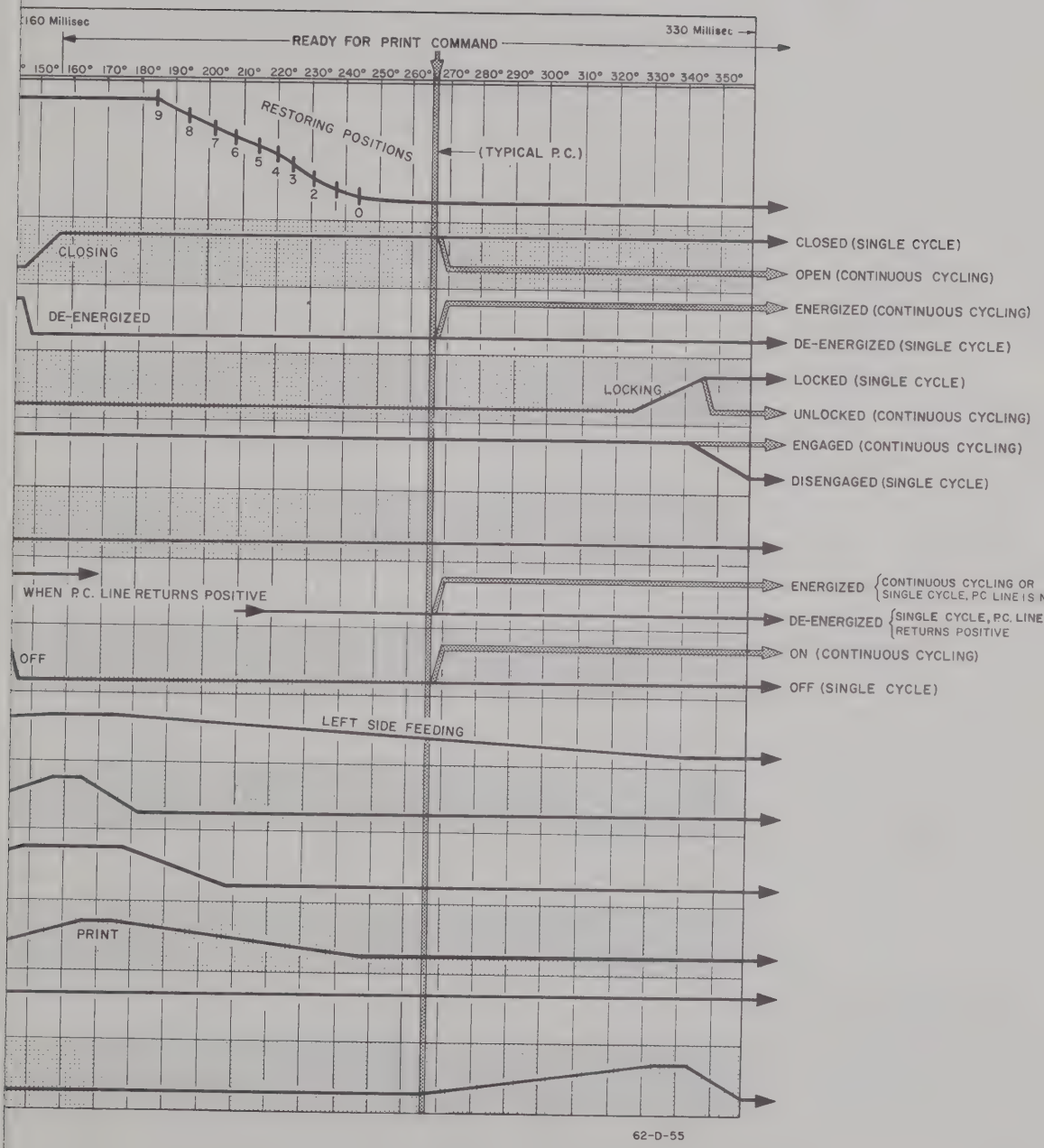
1) Power transformer T101 is replaced by a transformer with a 230 volt, 50 cps primary, tapped at 11 7 volts and 126 volts.

2) Line fuses F101 and F102 have one half the current rating of those in the unmodified Printer.

3) The 60 cps drive motor (B101) is replaced by a 50/60 cps motor, wired to the 117 volt tap.

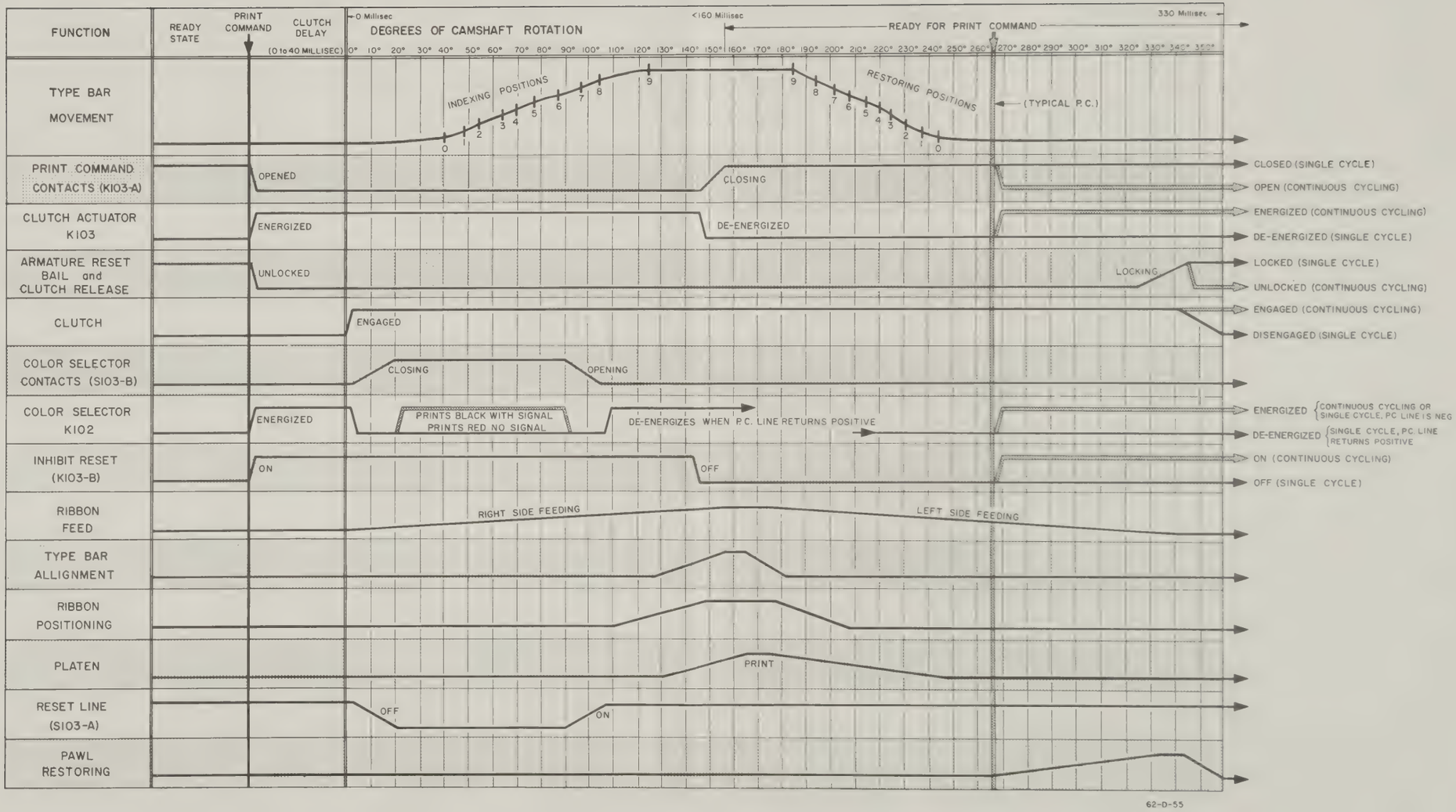
To operate the Printer on 117 volts or 126 volts (at 50 cps only), remove the wire that connects F101 to the 230 volt tap on the transformer, leaving the motor wiring undisturbed. Then connect the loose wire to the appropriate tap. Also, change F101 and F102 to 1.5 amp Slo-Blo fuses.

TIMING DIAGRAM



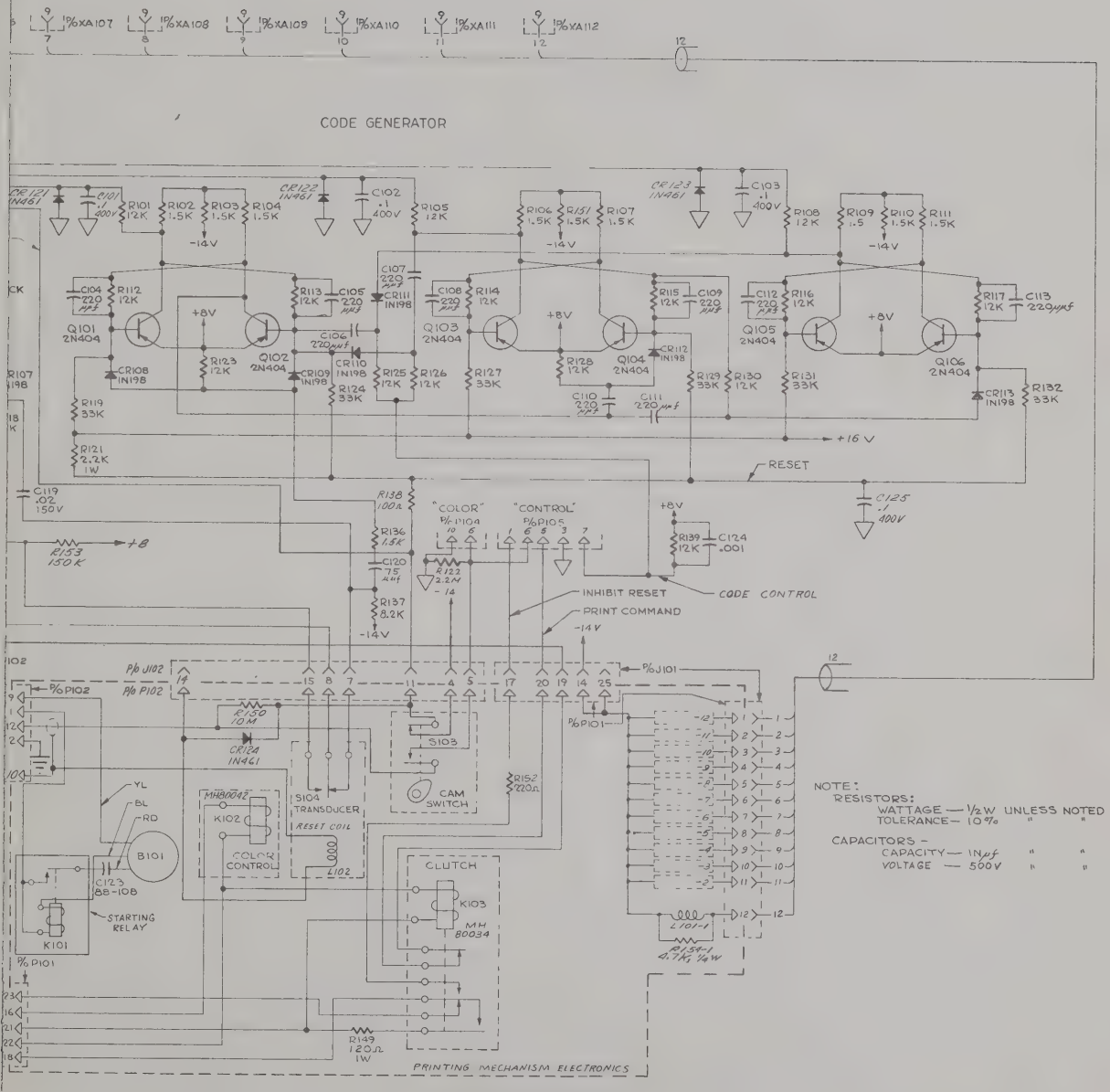
62-D-55

Beckman®


FUNCTION
READY STATE
PRINT COMMAND
CLUTCH DELAY
(0 to 40 MILLISEC)
0 Millisec
DEGREES OF CAMSHAFT ROTATION
<160 Millisec
READY FOR PRINT COMMAND
330 Millisec
0° 10° 20° 30° 40° 50° 60° 70° 80° 90° 100° 110° 120° 130° 140° 150° 160° 170° 180° 190° 200° 210° 220° 230° 240° 250° 260° 270° 280° 290° 300° 310° 320° 330° 340° 350°
TYPE BAR MOVEMENT
INDEXING POSITIONS
0 1 2 3 4 5 6 7 8 9
RESTORING POSITIONS
9 8 7 6 5 4 3 2 1 0
(TYPICAL P.C.)
PRINT COMMAND CONTACTS (K103-A)
OPENED
CLOSING
CLOSED (SINGLE CYCLE)
OPEN (CONTINUOUS CYCLING)
CLUTCH ACTUATOR K103
ENERGIZED
DE-ENERGIZED
ENERGIZED (CONTINUOUS CYCLING)
DE-ENERGIZED (SINGLE CYCLE)
ARMATURE RESET BAIL and CLUTCH RELEASE
UNLOCKED
LOCKING
LOCKED (SINGLE CYCLE)
UNLOCKED (CONTINUOUS CYCLING)
CLUTCH
ENGAGED
ENGAGED (CONTINUOUS CYCLING)
DISENGAGED (SINGLE CYCLE)
COLOR SELECTOR CONTACTS (S103-B)
CLOSING
OPENING
COLOR SELECTOR K102
ENERGIZED
PRINTS BLACK WITH SIGNAL
PRINTS RED NO SIGNAL
DE-ENERGIZES WHEN P.C. LINE RETURNS POSITIVE
ENERGIZED {CONTINUOUS CYCLING OR SINGLE CYCLE, PC LINE IS NEG
DE-ENERGIZED {SINGLE CYCLE, PC LINE RETURNS POSITIVE
INHIBIT RESET (K103-B)
ON
OFF
ON (CONTINUOUS CYCLING)
OFF (SINGLE CYCLE)
RIBBON FEED
RIGHT SIDE FEEDING
LEFT SIDE FEEDING
TYPE BAR ALLIGNMENT
RIBBON POSITIONING
PLATEN
PRINT
RESET LINE (S103-A)
OFF
ON
PAWL RESTORING
62-D-55

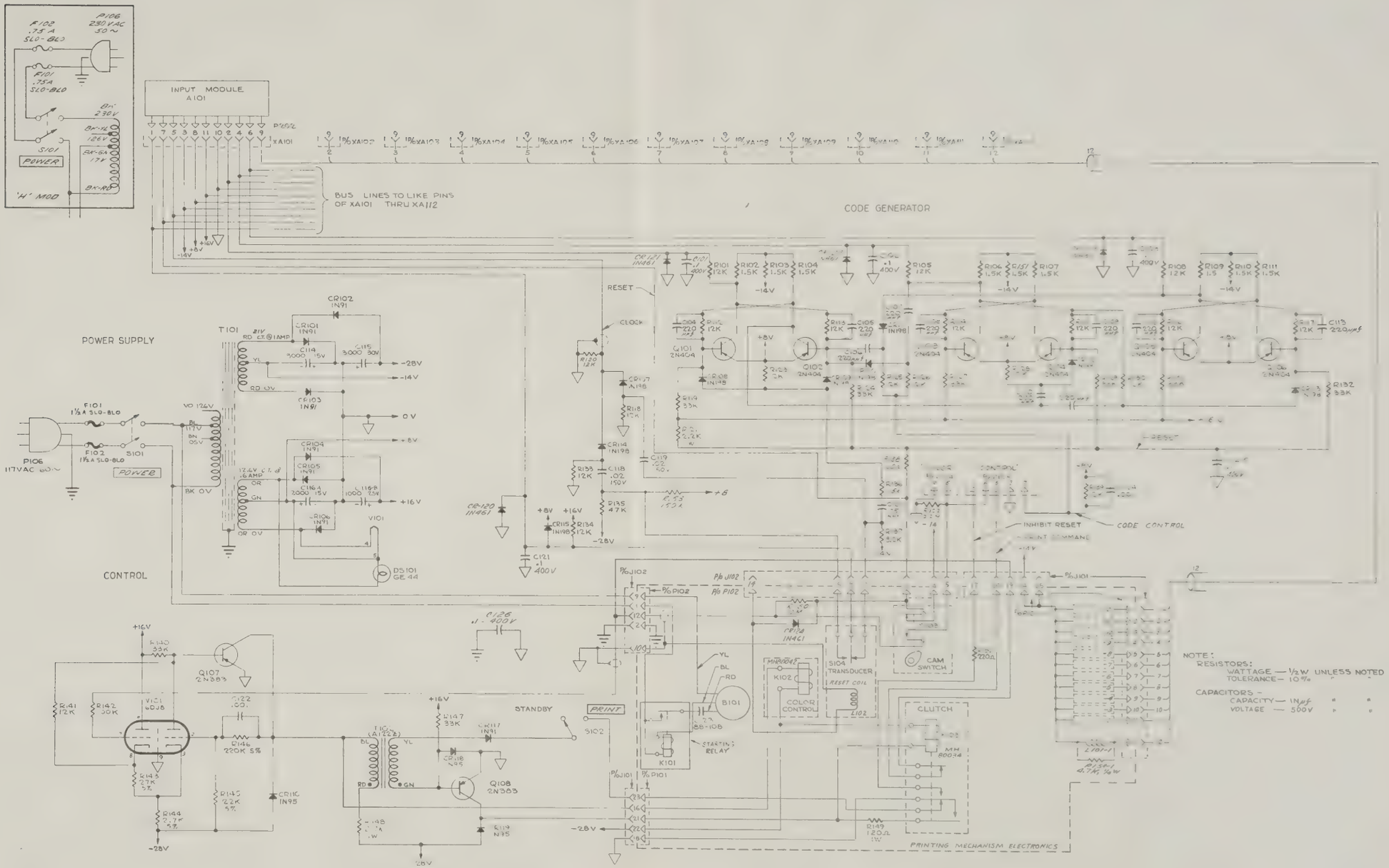
Beckman®

MODEL 1453 MASTER
SCHEMATIC DIAGRAM

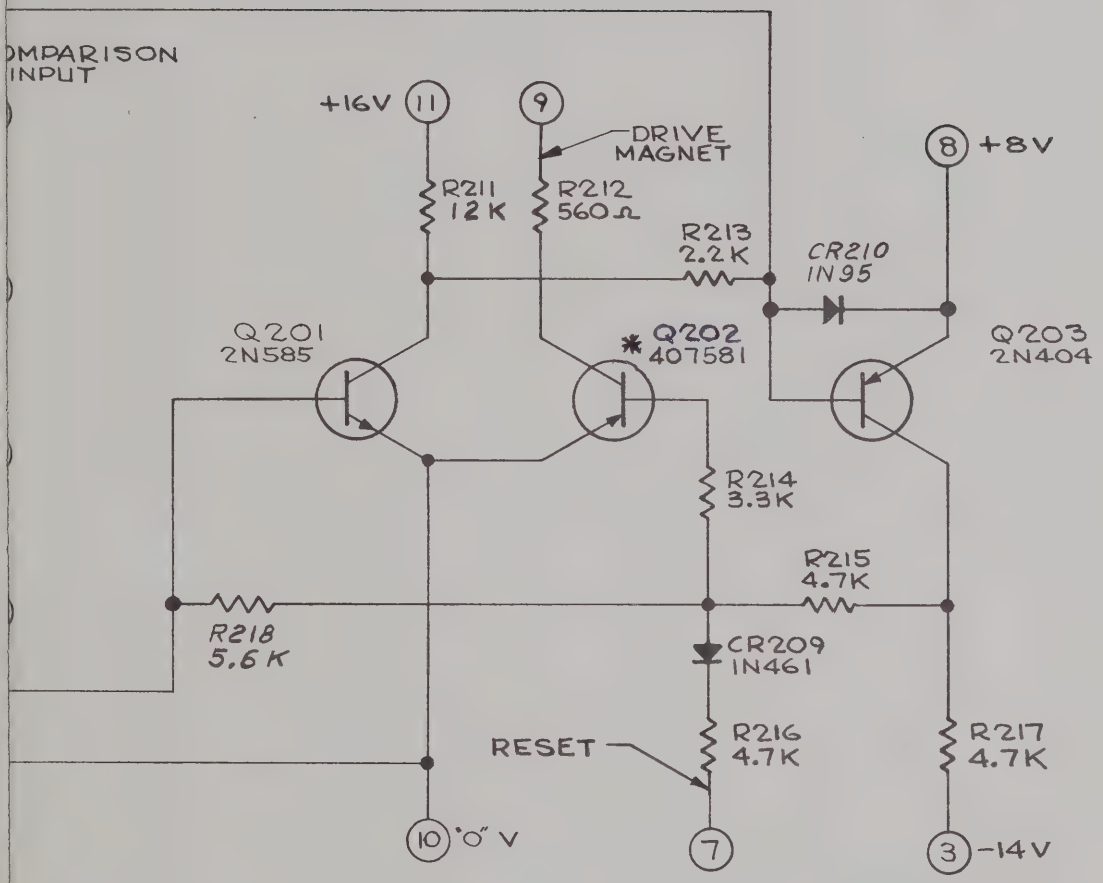


Model 1453
D408311-Rev. B
March 1962

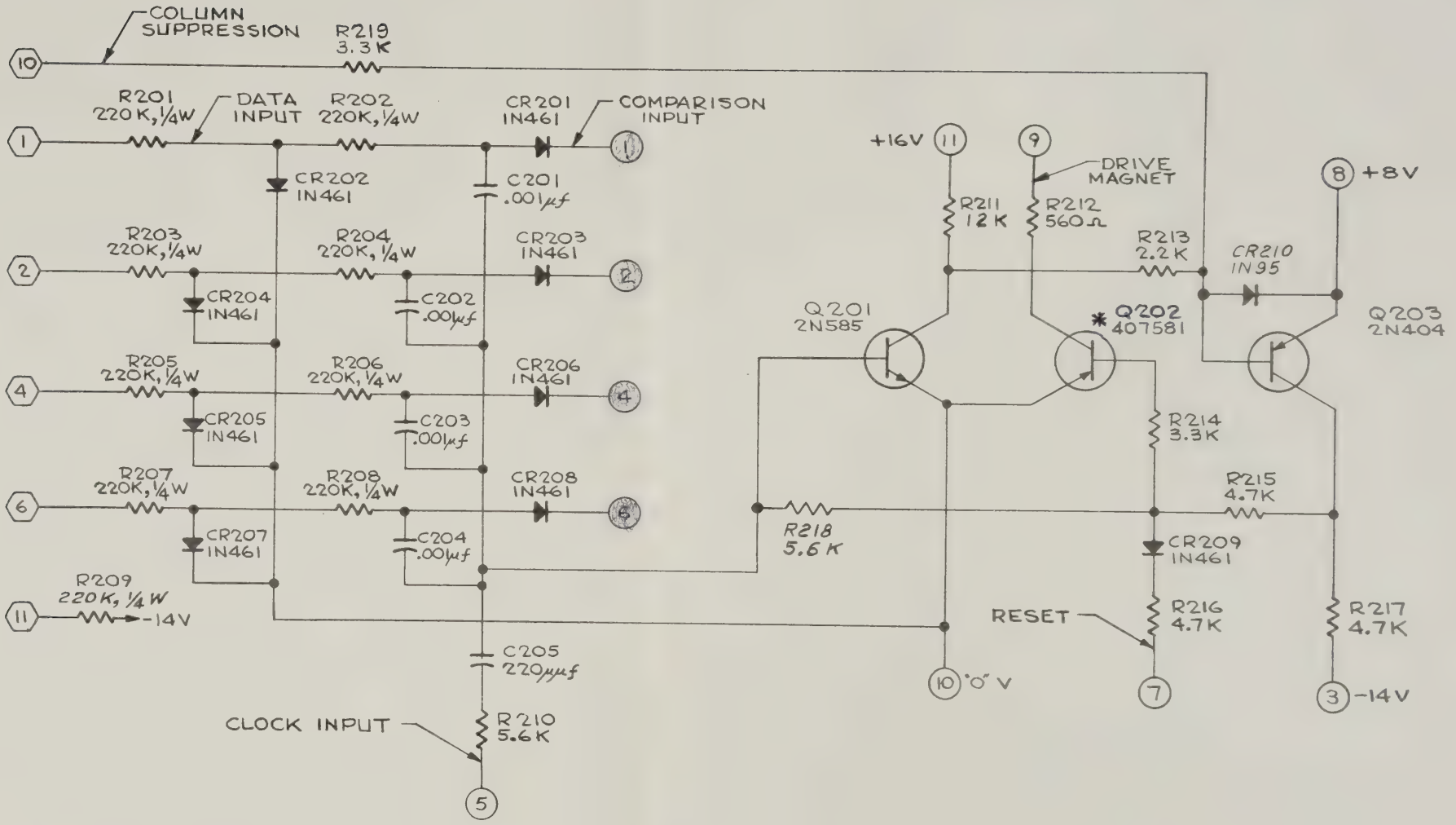
Beckman®


INPUT MODULE A101
BUS LINES TO LIKE PINS OF XA101 THRU XA112
CODE GENERATOR
POWER SUPPLY
CONTROL
RESET
CLOCK
INHIBIT RESET
CODE CONTROL
PRINTING MECHANISM ELECTRONICS
STANDBY
PRINT
NOTE:
RESISTORS:
WATTAGE — ½W UNLESS NOTED
TOLERANCE — 10%
CAPACITORS —
CAPACITY — IN μf
VOLTAGE — 500V

Beckman


OMPARISON
INPUT
+16V
11
9
DRIVE
MAGNET
8
+8V
R211
12K
R212
560Ω
R213
2.2K
CR210
IN95
Q201
2N585
*Q202
407581
Q203
2N404
R214
3.3K
R215
4.7K
R218
5.6K
CR209
IN461
RESET
R216
4.7K
R217
4.7K
10
"0" V
7
3
-14V

Beckman®



NOTE:

1) RESISTORS:
   WATTAGE — 1/2W UNLESS NOTED
   TOLERANCE — 10% " "

2) ⬡ — INDICATES PINS OF P201

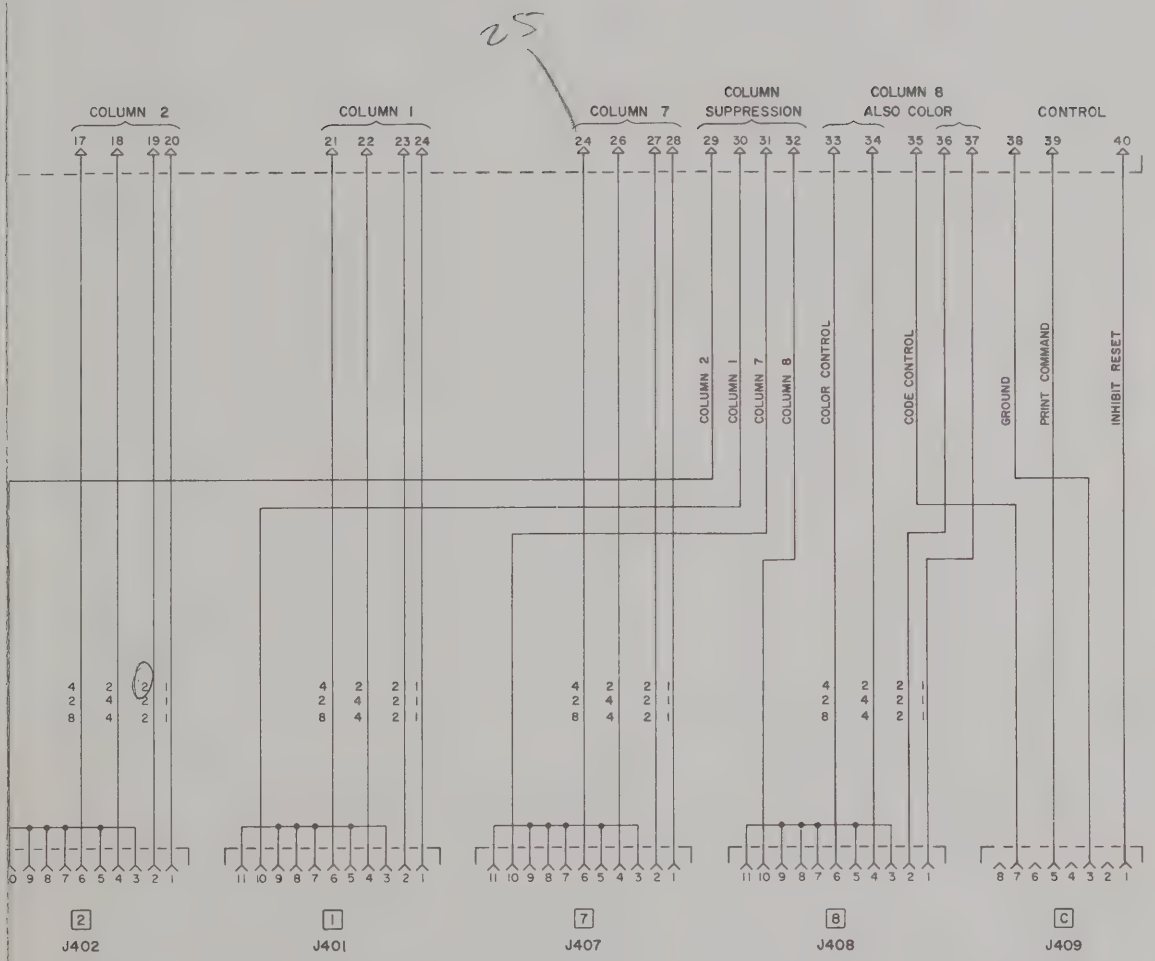
3) ◯ — INDICATES PINS OF P202

4) * BECKMAN PART NO.

Model 1453
B 404461-Rev. B
December 1961

Beckman®

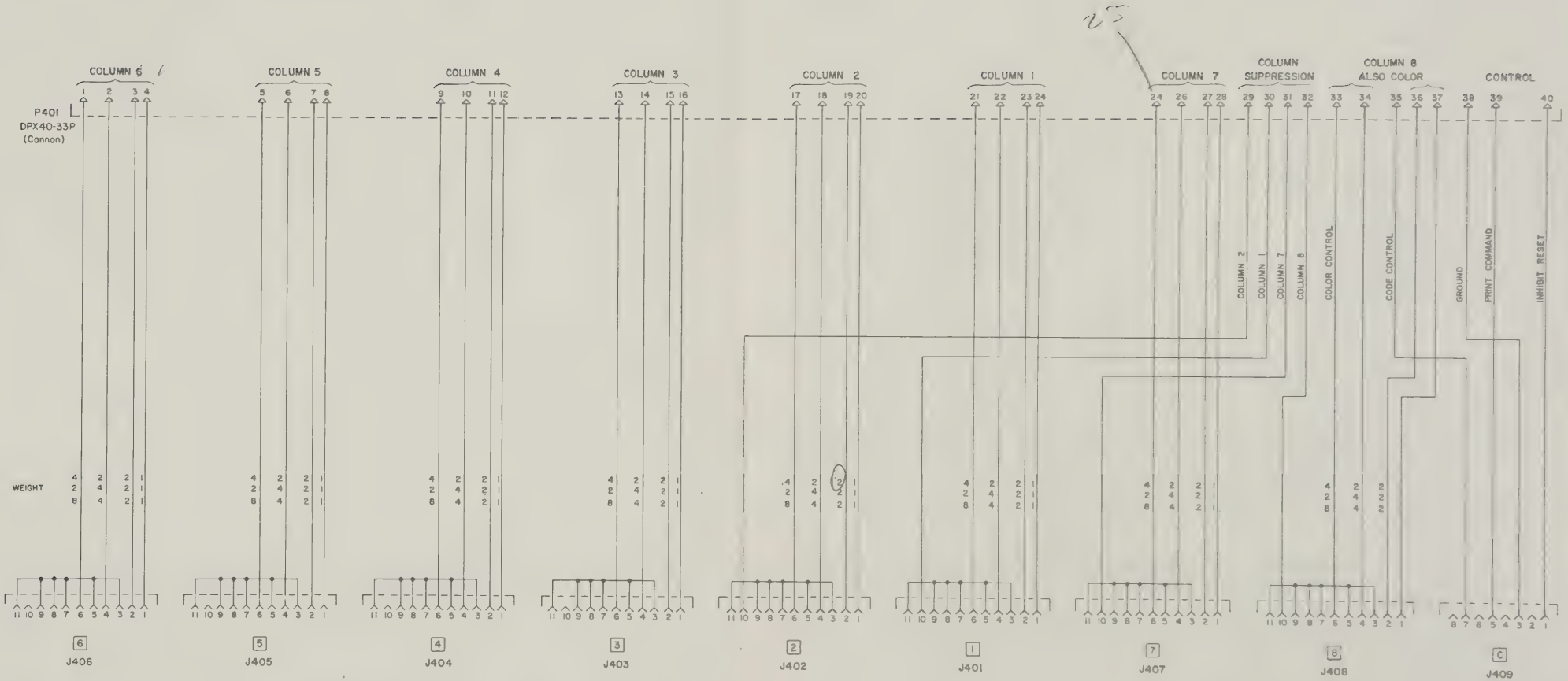
FOUR-LINE INPUT CABLE
SCHEMATIC DIAGRAM



62-D-56

Beckman

FOUR-LINE INPUT CABLE SCHEMATIC DIAGRAM

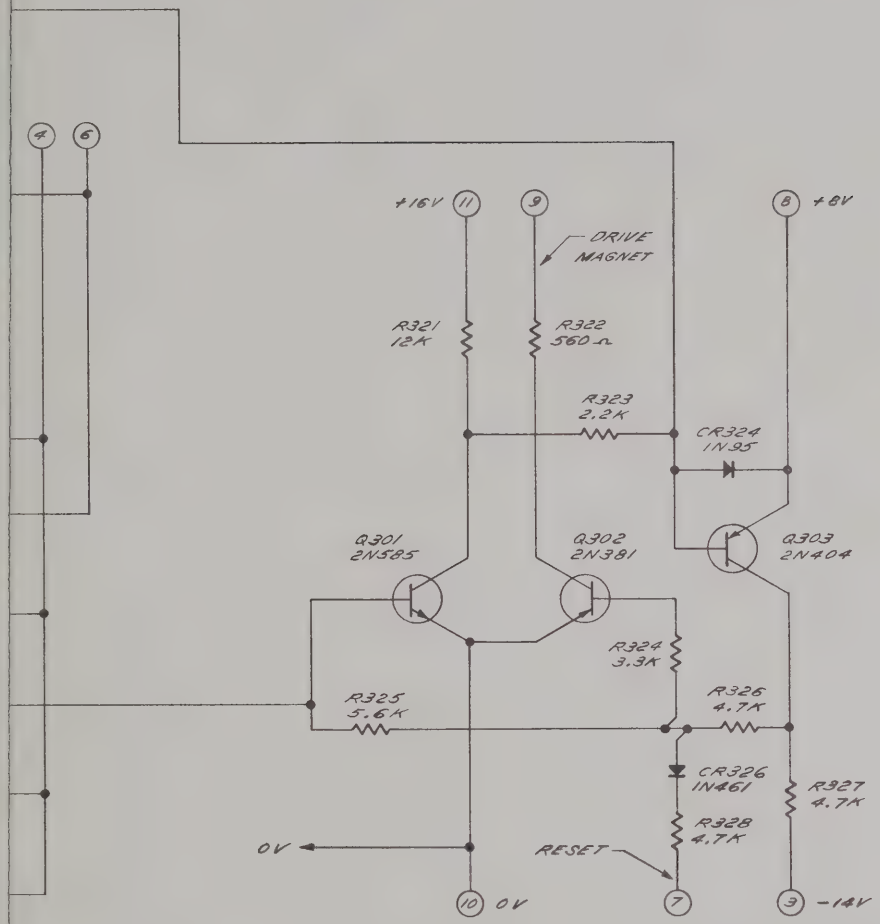


NOTE:
J401 thru J409 Amphenol 78-SIIT

62-D-56

Beckman

TEN-LINE
INPUT CODE MODULE
SCHEMATIC DIAGRAM



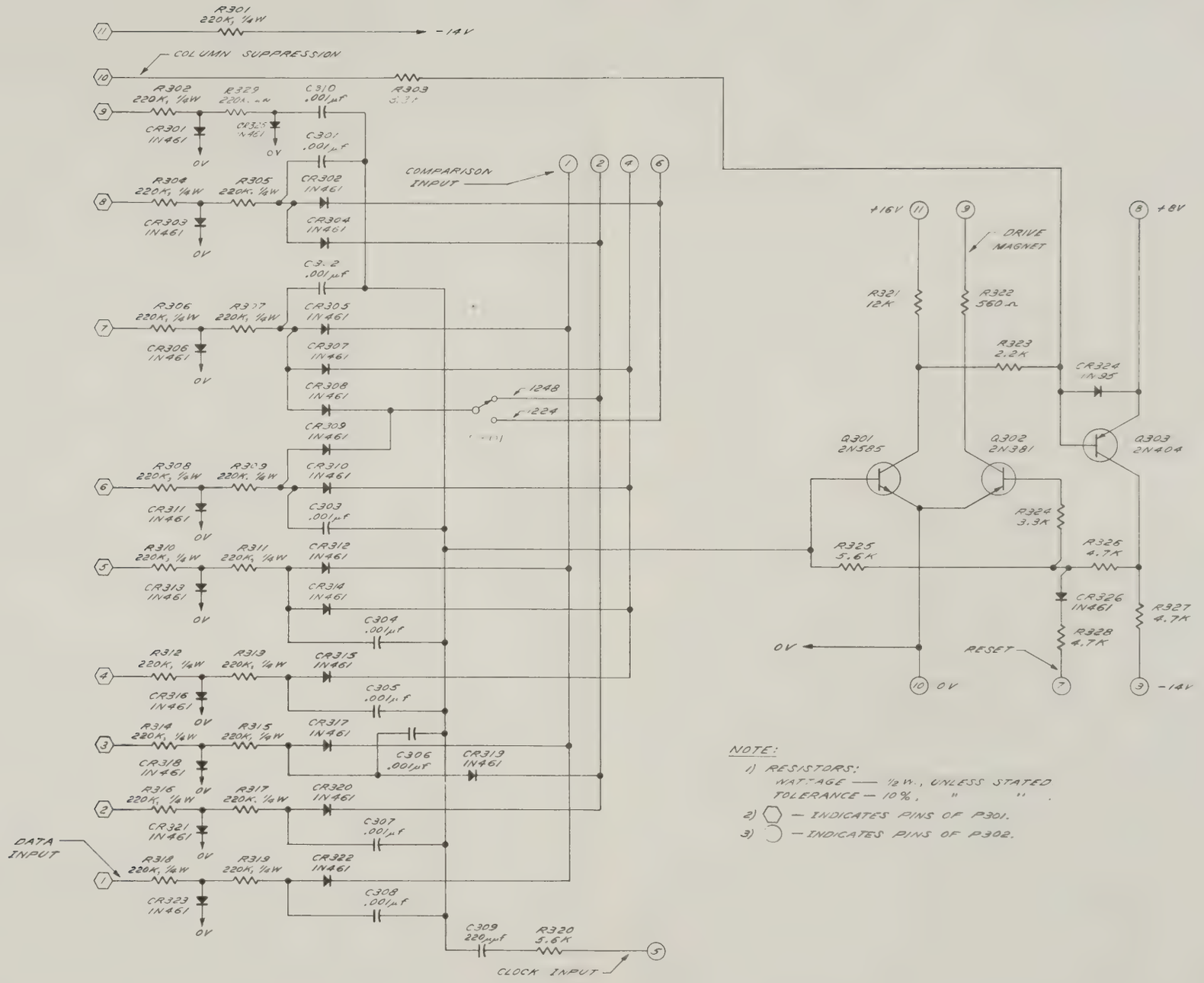
NOTE:

1) RESISTORS:
   WATTAGE — ½ W., UNLESS STATED.
   TOLERANCE — 10%, " " .
2) ⬡ — INDICATES PINS OF P301.
3) ◯ — INDICATES PINS OF P302.

Model 1453
C 404454-Rev. A
March 1962

Beckman®

TEN-LINE
INPUT CODE MODULE
SCHEMATIC DIAGRAM



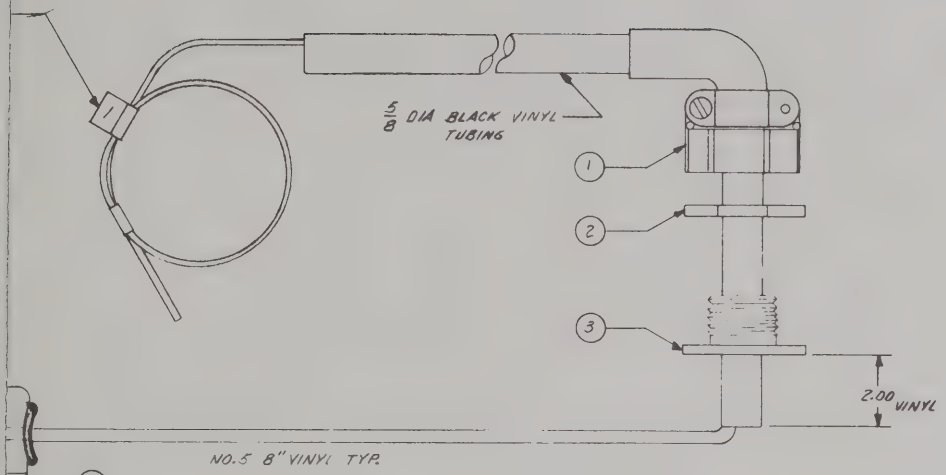
NOTE:

1) RESISTORS:
   WATTAGE — 1/2 W., UNLESS STATED
   TOLERANCE — 10%, " "
2) ⬡ — INDICATES PINS OF P301.
3) ◯ — INDICATES PINS OF P302.

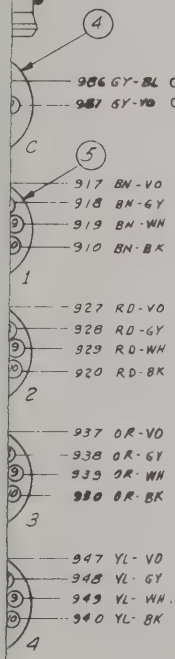
Model 1453
C 404454-Rev. A
March 1962

Beckman®

TEN-LINE INPUT CABLE
SCHEMATIC DIAGRAM



NOTES:
1) WIRE LENGTHS TO BE 12'0".
2) VINYL LENGTH TO BE 10'0".



ITEM	PART NO	DESCRIPTION	QTY
13	T697-404585	HOOD SILKSCREEN C	1
12	T697-404579	7	1
11	T697-404578	6	1
10	T697-404577	5	1
9	T697-404576	4	1
8	T697-404575	3	1
7	T697-404574	2	1
6	T697-404573	1	1
5	860-011948	11 PIN SOCKET	7
4	860-023566	8 PIN SOCKET	1
3	A699-404566	CANNON AN3064-10	1
2	699-801709	CANNON AN3066-10	1
1	697-806983	CANNON AN3057-10A	1

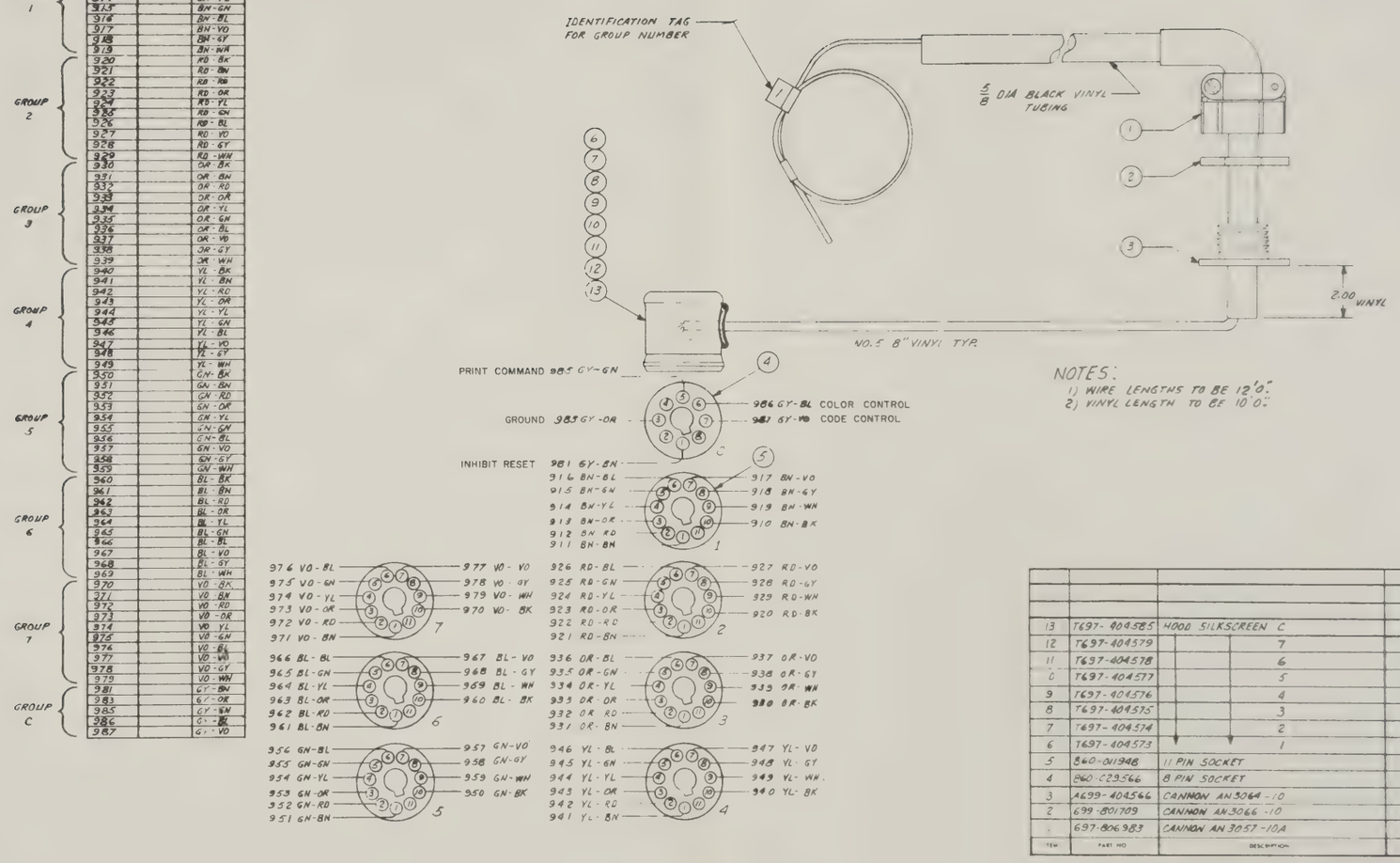
62-C-114

Model 1453
62-C-114
March 1962

Beckman®

TEN-LINE INPUT CABLE SCHEMATIC DIAGRAM

	WIRE NO.	PIN NO.	COLOR
GROUP 1	910		BN-BK
	911		BN-BN
	912		BN-RD
	913		BN-OR
	914		BN-YL
	915		BN-GN
	916		BN-BL
	917		BN-VO
	918		BN-GY
	919		BN-WH
GROUP 2	920		RD-BK
	921		RD-BN
	922		RD-RD
	923		RD-OR
	924		RD-YL
	925		RD-GN
	926		RD-BL
	927		RD-VO
	928		RD-GY
	929		RD-WH
GROUP 3	930		OR-BK
	931		OR-BN
	932		OR-RD
	933		OR-OR
	934		OR-YL
	935		OR-GN
	936		OR-BL
	937		OR-VO
	938		OR-GY
	939		OR-WH
GROUP 4	940		YL-BK
	941		YL-BN
	942		YL-RD
	943		YL-OR
	944		YL-YL
	945		YL-GN
	946		YL-BL
	947		YL-VO
	948		YL-GY
	949		YL-WH
GROUP 5	950		GN-BK
	951		GN-BN
	952		GN-RD
	953		GN-OR
	954		GN-YL
	955		GN-GN
	956		GN-BL
	957		GN-VO
	958		GN-GY
	959		GN-WH
GROUP 6	960		BL-BK
	961		BL-BN
	962		BL-RD
	963		BL-OR
	964		BL-YL
	965		BL-GN
	966		BL-BL
	967		BL-VO
	968		BL-GY
	969		BL-WH
GROUP 7	970		VO-BK
	971		VO-BN
	972		VO-RD
	973		VO-OR
	974		VO-YL
	975		VO-GN
	976		VO-BL
	977		VO-VO
	978		VO-GY
	979		VO-WH
GROUP C	981		GY-BN
	983		GY-OR
	985		GY-GN
	986		GY-BL
	987		GY-VO

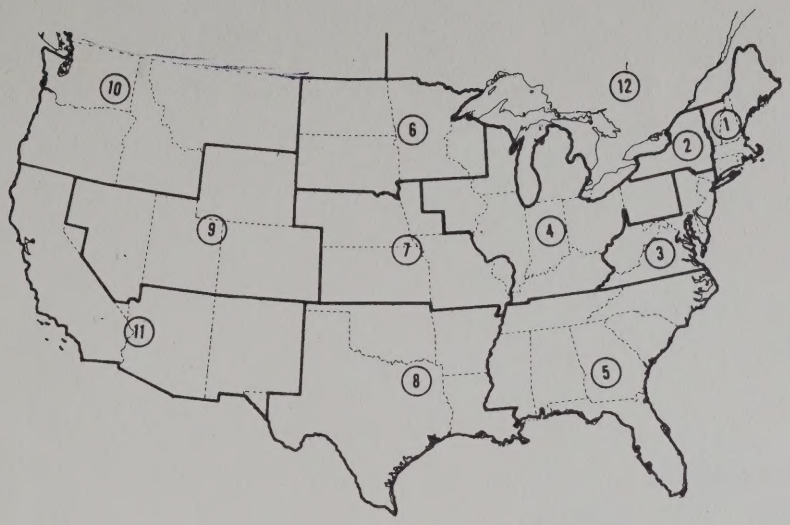


NOTES:
1) WIRE LENGTHS TO BE 12'0".
2) VINYL LENGTH TO BE 10'0".

ITEM	PART NO	DESCRIPTION	QTY
13	T697-404585	HOOD SILKSCREEN C	1
12	T697-404579	7	1
11	T697-404578	6	1
10	T697-404577	5	1
9	T697-404576	4	1
8	T697-404575	3	1
7	T697-404574	2	1
6	T697-404573	1	1
5	360-011948	11 PIN SOCKET	7
4	360-029566	8 PIN SOCKET	1
3	A699-404566	CANNON AN3064-10	1
2	699-801709	CANNON AN3066-10	1
1	697-806983	CANNON AN3057-10A	1

62-C-114

Beckman



"Instrumental In Your Future"

BECKMAN/BERKELEY REPRESENTATIVES

1 BROGER INSTRUMENT SALES COMPANY, INC.

Boston Area
48 Pearl Street
Brookline 47, Massachusetts
Phone: BEacon 2-4804

New Haven 15, Connecticut
31 Broadway
P. O. Box 2917
Phone: SPruce 7-6279

2 SBM ASSOCIATES, INC.

Rochester 10, New York
177 Winton Road, North
Phone: OLympic 4-8440

Utica, New York
232 Roosevelt Drive
Phone: REdwood 2-4410

Binghamton, New York
Nowlan Road, R.D. No. 3
Phone: RAymond 2-2648

Syracuse, New York
1943 West Fayette Street
Phone: HOward 8-5041

3 GAWLER-KNOOP COMPANY

New York City Area
178 Eagle Rock Avenue
Roseland, New Jersey
Phone: CAldwell 6-4545
DIgby 4-2997 (N. Y. C.)

Washington, D. C. Area
8732 Flower Avenue
Silver Spring, Maryland
Phone: JUniper 5-7550

Philadelphia Area
835 Glenside Avenue
Wyncote, Pennsylvania
Phone: WAverly 7-1820

Baltimore Area
807 East Seminary Avenue
Towson 4, Maryland
Phone: ENterprise 9-3151

INTERNATIONAL SALES EXCEPT CANADA:

Beckman Instruments International, S.A.,
Geneva, Switzerland

Beckman Instruments, GmbH, Munich, Germany

Beckman Instruments, Ltd., Glenrothes, Scotland

4 RIDGWAY ASSOCIATES

Chicago 39, Illinois
6100 West North Avenue
Phone: TUxedo 9-5715

Indianapolis 2, Indiana
1224 North Capitol Avenue
Phone: MElrose 5-2401

Cleveland 31, Ohio
5917 Schaaf Road
Phone: LAfayette 4-1421

Dayton 32, Ohio
3898 Linden Avenue
Room 209 Arcade
Phone: CLearwater 2-5604

Detroit Area
3384 West Twelve Mile Rd.,
Berkley, Michigan
Phone: LIncoln 6-3312

5 MURPHY AND COTA

Atlanta 9, Georgia
2110 Peachtree Road, N.W.
Phone: TRinity 6-3020

Orlando, Florida
2319 E. South St.
Phone: GArden 4-2167

Winston-Salem, North Carolina
1106 Burke Street
Phone: PArk 4-0750

Huntsville, Alabama
Room 216
Electric Systems Center
Phone: JEfferson 9-8476

6 PINKNEY & HINE COMPANY

Minneapolis 3, Minnesota
1925 Nicollet Avenue
Phone: FEderal 8-0523

7 LEEMARK ASSOCIATES

Kansas City 15, Missouri
4021 West 86th Street
Phone: NIagara 2-3313

St. Louis 17, Missouri
2001 Big Bend Boulevard
Phone: MIssion 7-1470

8 DANNEMILLER-SMITH, INC.

Dallas 35, Texas
2712 West Mockingbird Lane
Phone: FLeetwood 7-8249

Houston 27, Texas
6218-B Westheimer Road
Phone: SUnset 2-7350

9 WILLIAMS & ASSOCIATES, INC.

Denver 22, Colorado
2261-63 South Albion Street
Phone: SKyline 6-9403

Salt Lake City, Utah
362 Pierpont Ave.
Phone: 328-3101

10 RUSH S. DRAKE ASSOCIATES, INC.

Seattle 44, Washington
1817 South Norman Street
Phone EAst 3-8545

Idaho Falls, Idaho
P. O. Box 2126
Phone: JAckson 2-7992

11 V. T. RUPP COMPANY

Los Angeles 26, California
307 Parkman Avenue
Phone: DUnkirk 7-8224

Albuquerque, New Mexico
1437 San Mateo, N.E.
Phone: 256-0798

San Diego 3, California
3445 - 5th Avenue
Phone: CYpress 8-9835

San Francisco Area
1182 Los Altos Avenue
Los Altos, California
Phone: 948-1483

12 R-O-R ASSOCIATES, LIMITED

Toronto, Ontario
1470 Don Mills Road
Don Mills, Ontario
Phone HIckory 4-4429

Montreal, Quebec
3333 Cavendish Boulevard
Phone: HUnter 1-0700

Ottawa 3, Ontario
864 Lady Ellen Place
Phone: PArkway 9-1585

Represented by
RIDGWAY ASSOCIATES
3384 W. TWELVE MILE
Berkley, Michigan Lincoln 6-3312